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Royal ... of England and Wales
Transactions
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(1904— 1905)
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THE AGRICULTURAL COLLEGE,

ASPATRIA, Cumberland.

(VIA CARLISLE).

President.

Sir WILFRID LAWSON, Bart., M.P.

Principal.

J. SMITH HILL, B.A., B.Sc. (London).

Prizeman of the Royal Agricultural Society, Associate and Gold Medallist of the Surveyors' Institution.

Assisted by a highly efficient staff of Lecturers and Instructors.

THE College is situated in one of the finest stock-raising districts of the north-west of England, within easy distance of Keswick and the Lake District, and but four miles from the Solway Coast. Six Farms, Dairy, and Workshops.

COURSE.

Adapted for the Scientific and Practical Instruction of future Land Agents, Farmers, and Owners, as well as for intending Colonists.

Practical Farm Work is engaged in every day.

A most suitable training ground for future settlers in South Africa, the breeding and feeding of stock, dairying and corn-growing being extensively carried on in the district.

SUCCESSES.

Gold Medal and First Place and several Silver Medals in the Royal Agricultural Society's Examination in the Science and Practice of Agriculture.

Diplomas of the University of Cambridge in Agriculture.

Many successes in the Diploma Examination of the Highland and Agricultural Society of Scotland, the Professional Associateship Examination of the Surveyors' Institution, etc.

An Arboretum of 200 Trees in the College Grounds; representing the chief Forest and Ornamental Trees to be met with on an Estate.

Lectures and Practical Work in Forestry and Timber Measuring part of the ordinary curriculum.

For Prospectus, Forms of Entry, etc., application should be made to the Principal.

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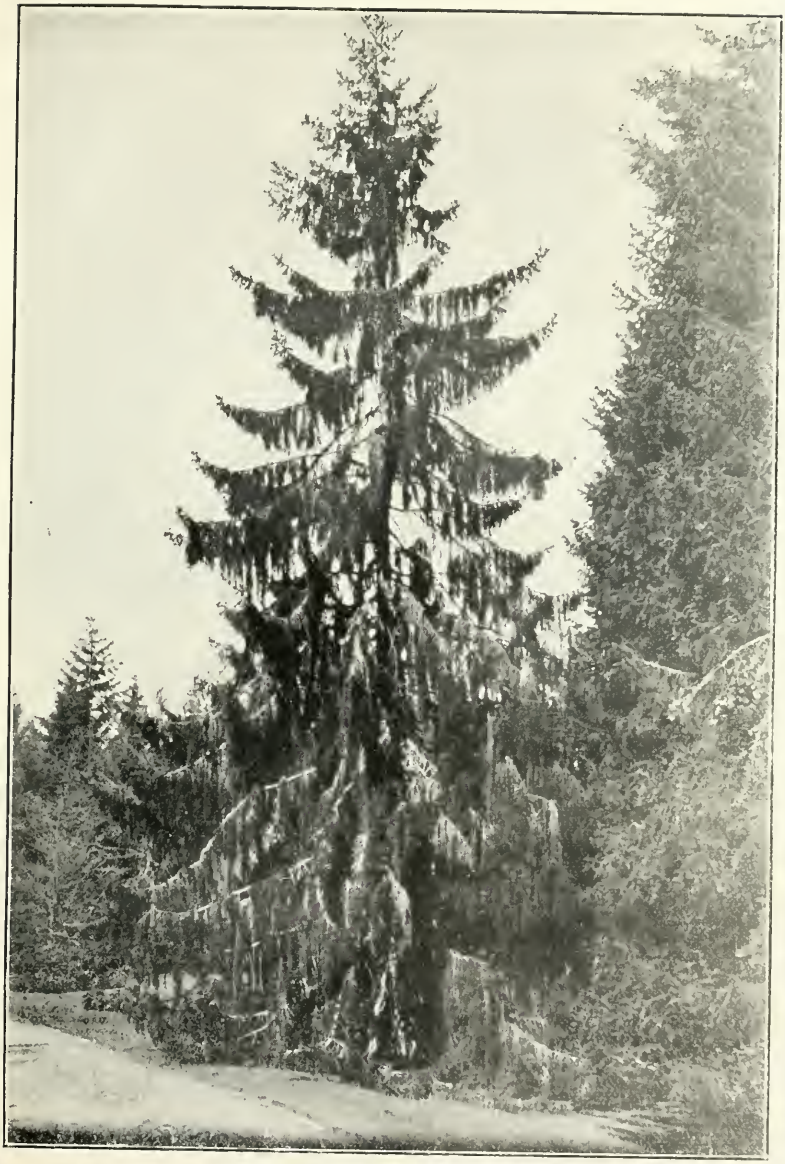


Picea Excelsa Inverta (The Pendulous Branchletted Spruce).
Height, 70 feet; Girth at 5 feet, 6 feet. A rare and beautiful sport from the Norway Spruce, the tassel-like tufts of branchlets depending to a length of five feet on the lower branches.

English Arboricultural Society.

TWENTY-THIRD ANNUAL MEETING.

The Twenty-third Annual Meeting of the English Arboricultural Society was held in Scotland, from August 16th to August 19th, 1904, the headquarters being the Palace Hotel, Aberdeen.

The members and friends present included :—Mr. J. T. Atkin, South Shields ; Mr. G. B. Atkinson, Newcastle ; Mr. T. H. Atkinson, Hexham ; Mr. L. W. Atkin Adams, Mill Hill, Middlesex ; *Mr. W. Armstrong, Bardon Mill ; Mr. J. R. Bell, Bedale ; Mr. A. Bown, Harrogate ; *Mr. E. Bown, Hull ; Mr. W. Beeson, Oxford ; Mr. T. Bond, Chester-le-Street ; Mr. E. J. Batchelor, Harrogate ; Mr. R. T. Benson, Darlington ; Sir H. Beevor, Bart., Croxley Green ; Mr. Jos. Bowker, Darlington ; Mr. F. W. Beadon, Huddersfield ; Mr. E. Brown ; Mr. G. Cooper, Gateshead ; Mr. B. Cowan, South Shields ; Mr. J. J. Cameron, Glasgow ; *Mr. A. Currie, Newcastle ; *Mr. B. O. Coventry, London ; *Mr. J. Clapperton, Aberdeen ; Mr. J. Davidson, Haydon Bridge ; Mr. E. Davidson, Haydon Bridge ; Mr. J. A. Duthie, Aberdeen ; Mr. Chas. Doig, Ollerton ; *Mr. R. Dingwall, Newcastle ; *Mr. Ed. Drake, South Shields ; Mr. R. Ellison, Witton Gilbert ; *Mrs. Ellison, Witton Gilbert ; Mr. John Ferguson, Newcastle ; Mr. S. Finn, South Shields ; *Mr. J. H. Ferguson, Alnwick ; *Mr. T. R. Fletcher, Newcastle ; Mr. Wm. Forbes, Glasgow ; *Mr.

Friends are denoted by an asterisk (*).

C. J. France, 7 Belmont Place, Aberdeen; Mr. A. Gillies, Gateshead; Mr. L. H. Gullachsen, Newcastle; Mr. L. W. Gullachsen, Newcastle; Mr. F. Glover, Ormskirk; Mr. A. T. Gillanders, Alnwick; Mr. Wm. Garratt, Melbourne; Mr. Jos. S. Gray, York; Mr. John Graham, Sacriston; Mr. G. Gallie, York: Mr. T. Guthrie, South Shields; Mr. W. Graham, Alnwick; *Mr. Godley, Worksop; Mr. W. B. Havelock, Brocklesby; Mr. J. Smith Hill, Aspatria; *Mrs. Hill, Aspatria; Mr. A. Henry, London; Mr. D. Hamilton, Prescot; *Mr. T. F. Hedley, Alnwick: Mr. W. A. Herd, Penrith; Mr. F. Hull, Newport; *Mr. G. M. Harris, Hexham; Mr. G. Irving, Corbridge; Mr. W. James, Brampton; *Mr. W. H. Jessop, Huddersfield: Mr. A. P. Kerr, Hexham; Mr. E. H. Lincoln, Cleadon; Mr. P. O. Laidlaw, Fourstones; Mr. D. P. Laird, Edinburgh; Mr. Geo. Liddell, Kimblesworth: Mr. D. L. Mackintosh, Lochearnhead; Mr. Job Molyneux, Portlaw, Ireland: Mr. J. C. Maudlen, Newcastle; *Mrs. Maudlen, Newcastle; Mr. G. Marshall, Liphook; Mr. C. Miles, Stamford; Mr. E. M. A. Moir, Edinburgh; Mr. W. Milne, Hexham: Mr. J. Martin, Grantham; Mr. J. Milthorpe, Newcastle; Mr. R. Mc.Gibbon, Rotherham; Mr. G. R. Nixon, Alnwick; *Mr. J. H. Osmond-Smith, Uckfield; Mr. D. Petrie, South Shields; Mr. W. Palliser, Blackhill; Mr. J. Palliser, Blackhill; Mr. H. Reid, Long Ashton; Mr. G. Ross, Hexham; Mr. C. Richardson, Stamfordham; Mr. L. J. C. Riley, Ledbury; Mr. G. Renton, Harrogate; *Mr. T. R. V. Renton, Harrogate; *Miss Ryott, Gateshead; Mr. W. V. K. Stenning, East Grinstead; Mr. W. W. R. Sewell, Cockermouth; Mr. H. B. Score, Ormskirk; Mr. J. M. Smith, South Shields; Mr. J. O. Smith, South Shields; Mr. Ed. Slater, Newcastle; Mr. N. Temperley, Gateshead; Mr. J. Taylor, South Shields; Mr. A. C. Thimbleby, Reading; *Mr. L. L. Thimbleby, Reading; *Mr. B. L. Thimbleby, Reading; Mr. F. J. Thomson, Brayton, Carlisle; Mr. T. G. Whitmore, Bury St. Edmunds; Mr. L. S. Wood, East Grinstead; Mr. E. Wiseman, Elgin; Mr. J. Wilson, South Shields; *Mr. John B. Weir, South Shields; Mr. W. J. Wood, South Shields; Mr. N. I. Wright, Morpeth: *Mrs. Wicks, Gateshead; Mr. J. W. Watt, Carlisle; Mr. R. F. Woodcock, Haslemere; Mr. H. J. Young, South Shields.

Friends are denoted by an asterisk (*)

The members had for the most part started with the early morning north trains, and after the long fatiguing journey, were delighted to find themselves in the finely appointed and comfortable hotels, the Palace, the Imperial, and the Grand, the best in the Granite city. Old friends met, and new members were soon introduced by the officials. The President, Mr. George Marshall, gave all a hearty reception, and the Secretary, Mr. John Davidson, accompanied by the Assistant-Secretary, Mr. Edward Davidson, had everything in perfect order for the Annual General Meeting which was held later in the evening.

THE ANNUAL GENERAL MEETING.

The Twenty-third Annual General Meeting of the Society was held on Tuesday evening, August 16th, 1904, in the Palace Hotel, Aberdeen, the President, Mr. George Marshall, in the chair.

Minutes.

The Assistant-Secretary (Mr. Edward Davidson), read the minutes of the previous annual meeting, and the record being found correct, was adopted.

Election of New Members.

Mr. Edward Davidson said :—I have pleasure in submitting for your approval a list of new members. Thirty-four have been nominated at Council meetings and sixty have been proposed this evening—a total of ninety-four (applause). The list contains the names of the following gentlemen :—

Elected at Council Meeting, Oct. 9th, 1903.

Bourne and Son, Messrs., Nurserymen, Beckington, Bath.
Beeton, H. R., 9 Maresfield Gardens, Hampstead, London.
Crosland, Walter, Estate Offices, Buscot Park, Faringdon, Berks.
Cocker, James, The Gardens, The Chesters, Hexham.
Davison, Richard, National School, Belford.

Jeffries, W. J., The Nurseries, Cirencester.
Morrison, W. J., Shaftoe Grammar Schools, Haydon Bridge.
Morgan, H., Pontygwaith Farm, near Preharris, R.S.O., South Wales.
Staton, John E., High Legh, Knutsford, Cheshire.
Thwaites, Wm., Swinton, Masham.

Elected at Council Meeting, 29th April, 1904.

Adams, S. J., Adscombe Cottage, Over Stowey, Bridgwater.
Aitken, G. H., Longleat Estate Office, Warminster.
Bradford, Dr. J. R., 8 Manchester Square, W.
Benson, R. T., Parkside House, Darlington.
Cundy, J. W., Linby, Notts.
Eltringham, A., 3 Marine Approach, South Shields.
Gordon, P., Rope Moor, Ferry Hill, Co. Durham.
Howard, A., 9 Sussex Place, Regents Park, N.W.
Huggins, D., Estate Office, Brill, Bucks.
Haggart, W., 4 Myrtle Crescent, South Shields.
Luttrell, J. F., Dunster Castle, Dunster, Somerset.
Moreton, Lord, Sarsden House, Chipping Norton.
Neate, A. W., Junr., Newbury, Berks.
Pitt, Dr. J. N., 15 Portland Place, W.
Piek, S., 5 Leazes Terrace, Hexham.
Riley, Lancelot J. C., Putley Court, Ledbury, Herefordshire.
Rogers, J. P., Penrose, Helston, Cornwall.
Readhead, John, Rockcliffe, Westoe, South Shields.
Storey, Fraser, University College of North Wales, Bangor, Wales.
Smith, C., Thorney, Peterborough.
Smith, C., Junr., Grindleford Bridge, Sheffield.
Trussler, H., Ardgowan, Inverkip, Greenock.
Woodcock, R. F., Land Agent, Haslemere.
Yorks. Maurice, 35 New Walk, Leicester.

Elected at Annual Meeting, 16th August, 1904.

Adams, J. W. Atken, Moat Mount, Mill Hill, Middlesex.
Arnott, James, 9, Eslington Terrace, Newcastle.
Barton, H. S., Pickforde, Picehurst, Essex.

Bentley, Joseph, Chemical Manufacturer, Barrow-on-Humber, Hull.
Borthwick, Dr. A. W., Royal Botanic Gardens, Edinburgh.
Bovill, Geo. B., Rhydycrena, Bettws-y-coed, North Wales.
Campbell, J. A., Ardnaine, Loch Gilphead, N.B.
Champion, G. E., Estate Office, Linton Park, Maidstone.
Cleeves, C. M. R., Highfield, Frant, Sussex.
Cobb, H., Higham, Kent.
Coventry, B. O., 24 Bollingbroke Grove, Wandsworth Common, S.W.
Crooks, James, Eccleston Park, Prescot.
Currie, A., 48 Jesmond Road, Newcastle-on-Tyne.
Ewing, Guy, Edenbridge, Kent.
Fotheringham, W. Stewart, Murthly, Perthshire, N.B.
Fraser, W., Lillieshall, Newport, Salop.
Grace, H. W., Hallgarth Hall, Winlaton, Co. Durham.
Harris, G. M., care of Wm. Fell and Co., Hexham.
Harvey, John, Forester, Trentham Estate, Stoke-on-Trent, Staffordshire
Hobbs, F., Crown Office, Monmouth.
Hollis, John, Forester, Godmersham Estate, Canterbury, East Kent.
Hornby, J. J., Knowsley, Prescot.
Hull, George, Lillieshall, Newport, Salop.
Innes, G. P. M., Craig-y-Haul, Castleton, Cardiff.
James, A. J., Edgeworth Manor, Cirencester.
Jonas, H. Driver, 23 Pall Mall, London.
Kendle, G. R., Wilton, Salisbury.
Kimm, J. J., Chesters, Humshaugh-on-Tyne.
Kininmouth, W., Wynyard Park, Wolviston, Durham.
Liddell, George, The Grange, Kimblesworth, Chester-le-Street.
Macky, M., Highbury, Newcastle-on-Tyne.
Mason, J. E., Horticultural Chemical Merchant, Barrow-on-Humber, Hull.
Maw, P. T., Holmesdale, Nutfield, Surrey.
Mc.Beath, D., Abbey Village, Withnell, Lancs.
Mildred, G. B., Leeton Lodge, Shrewsbury.
Mitchell, John, junr., Bolton Abbey, Skipton.
Hibberd, Thomas, junr., Bolton Abbey, Skipton.

Orwin, C. S., South Eastern Agricultural College, Wye, Kent.
Osmond-Smith, F. H., Lewes Villa, Uckfield, Sussex.
Pigot, J. L., care of Grindlay and Co., 54 Parliament Street, S.W.
Powell, James, Cærphilly, Wales.
Pritchard, H., Molton House, Llandaff Road, Cardiff.
Renton, T. R. V., Albert Street, Harrogate.
Saunders, A., Kingswood Cottage, Kingswood, Frodsham.
Sawyer, J. A., Winchester, Hants.
Scholfield, E. P., Somerley, Ringwood, Hants.
Score, H. B., Lathom Park Schools, Ormskirk, Lancashire,
Sewell, W. W. R., Brandlingill, Cockermouth.
Skewis, Ed., 29 Park Place, Hyde Park, W.
Stamer, W. E., Littlehalls Lodge, Newport, Shropshire.
Studdy, T. E., Estate Office, Basing Park, Alton, Hants.
Stanworth, D., Newport, Salop.
Stenning, W. V. K., Halsford, East Grinstead.
Sutherland, His Grace the Duke of, K.G., Lillieshall House, Newport.
Taylor, R., Cornhill-on-Tweed.
Thomas, E. A., 6 Brechin Place, Gloucester Road, S.W.
Wheldon, M. L., care of F. Handley, Esq., 17 St. Mary's, York.
White, John, Wynyard Park, Wolviston, Durham.
Whitehead, R. H., Bede College, Whitley Bay.
Wright, N. I., Timber Merchant, Morpeth.

The Membership—Large Increase.

Mr. John Davidson, the Secretary, reported on the state of the membership of the Society. The number of members at the commencement of the year was 675, and during the past year there had been 27 resignations and lapses. He might mention that the principal reason given by those who resigned for the step they had taken was that they had never been able to attend the annual meetings. Those gentlemen apparently did not take into account the *Transactions* of the Society and all the information available through con nection with it; but because they could not attend the annual meetings they had resigned. Four had died during the year, leaving a total of 644. The new members elected at the

Council meetings numbered 34, and at this meeting 60—a total of new members for the year of 94, and a grand total members of the Society at the present time of 738. (Cheers). Whilst it was very gratifying to them to have this large addition to the membership, it was with very great sorrow that they had to record the death of four of their very prominent members—Mr. Thomas Barningham, of Barnard Castle; Mr. John R. Brown, Altrincham. He (the Secretary) thought they were all very much indebted indeed to Mr. Brown for his enthusiasm in the work of the Society. He was always very active, and always in great demand in their wanderings round the different places. In fact, he was a court of appeal whenever there was any discussion or dispute as to the name of a tree. He was sure the members of the Society remembered Mr. Brown's name with gratitude. They greatly regretted the death also of Mr. James D. Coxon, of Barrasford, and Mr. John Luke, Hexham, who he believed was a member of the Society from its inception. However, they felt gratified at the increase, though they were sorry to lose those members.

Minutes of Condolence.

The President said: On this subject I would propose that we ask the Secretary to write condolences to the widows and families of our deceased members, who are so much missed and whose death has been such a loss to the Society. (Hear, hear.)

The motion was at once carried by a unanimous upstanding vote.

Financial Statement.

RECEIPTS.

Deposit in Bank brought forward from last account	£114	6	2
Cash in hand brought forward - - -	7	19	2
Advertisements in *Transactions* - - -	9	5	0
Subscriptions - - - - -	216	0	0
	£347	10	4

PAYMENTS.

Expenses of Annual Meeting, 1903						£13	16	9
Use of Rooms for Council Meetings		£5	8	5				
Councillors, Railway Fares		8	17	7				
						14	6	0
Silver Medals						2	14	0
Reporters and Expenses						5	8	0
Printing *Transactions* and Postage						68	15	2
Stationery and Printing						15	16	7
Postages, Telegrams, and Railway Carriages						23	6	10
Expenses Local Meetings, 1902, Lambton Castle (omitted from last year's account)		£1	13	4				
Darlington		1	15	2				
Bayham Abbey		4	2	11				
						7	11	5
Secretary attending Royal Scottish Arboricultural Society's Jubilee Meetings						2	7	6
Removal Expenses and new staging for plants presented by the Hon. Mark Rolle						4	14	9
Bookcase to hold back numbers of *Transactions*						5	0	0
Expenses arranging Annual Meeting, 1904						6	1	9
Secretary's Salary						25	0	0
Assistant Secretary's Salary						15	10	0
						210	8	9
Deposit in Bank, with Interest		£124	8	0				
Cash in hand		12	13	7				
						137	1	7
						£347	10	4

The SECRETARY said he might add that during the past year a great amount of arrears had been paid off, more so than was usually the case. (Applause.)

Major BEADON said: I have very great pleasure in proposing the adoption of this statement on our finances. It is most gratifying to learn that the arrears have been paid off to such an

extent. The question of arrears has been one of our greatest difficulties in times past. If members would only remember to pay up quicker in future it would save our Secretary a great amount of unnecessary trouble. (Hear, hear).

The Financial Statement was unanimously adopted.

Election of Officers.

The President.

The President: I have very great pleasure in proposing that Professor Fisher, Coopers Hill, be appointed President of this Society. I am sure a great many of us know Professor Fisher as an eminent arboriculturist, and those of our members who went to France appreciated, he was sure, the care and trouble Professor Fisher displayed in arranging that very successful meeting on the continent two years ago. (Applause). I have known him for many years. He has forestry at heart, and no man in the United Kingdom has had a more thorough training. He was educated in forestry a great many years ago in France, where many English foresters were trained in those days. He has also served for a time in India, and when he came home he received the appointment he has now at Coopers Hill. I have the greatest pleasure and confidence in proposing that Professor Fisher be elected President. (Applause).

Major Beadon: I second the motion with great pleasure. I think if he will accept the position of President of this Society he will do a great deal of good to it. (Applause).

The election was carried with acclamation.

Major Beadon asked, amid applause, if the President would kindly continue to act as Chairman of the meeting, in the unavoidable absence of Professor Fisher.

The President: I thank you all, gentlemen, for the manner you have received the suggestion of my friend, and at this point I must also say that I feel the honour conferred on me, not only by your asking me to take the chair now, but for having elected me

as your chairman for the past two years. I thank you for the compliment you have paid me, and I shall be happy to act as *locum tenens* for Professor Fisher at this meeting. (Applause.)

Vice-Presidents.

The Vice-Presidents were then elected. Mr. Joseph S. Gray, York, who retired by rotation and was eligible for re-election, was unanimously re-appointed. Mr. George Gallie, Sledmere, York, was elected to fill the vacancy caused by Professor Fisher's appointment to the Presidential chair.

Members of Council—Elections and Re-Elections.

Messrs. William Elder, Cholmondley; C. Hankins, Culford; George Ross, Hexham; and T. Bewick, Staindrop, who retired by rotation, were re-elected members of the Council; and Professor Potter, Durham College of Science, Newcastle, and Messrs. Leslie Wood, East Grinstead, D. Hamilton, Prescot, and T. Luke, Hexham, were appointed to fill vacancies.

The Secretaryships.

Mr. George Ross in proposing that Mr. John Davidson and Mr. Edward Davidson be appointed Secretaries, said, I am sure you will all join with me in expressing pleasure at seeing Mr. John Davidson with us, hale and hearty this year. (Cheers). I am perfectly certain, too, that I have only to propose his name and that of Mr. Edward Davidson as Secretary and Assistant-Secretary, to have your whole-hearted approval. (Hear, hear). I have, therefore, great pleasure in proposing that these gentlemen be re-appointed. (Loud cheers). The motion was carried by acclamation.

Auditors.

The Hon. Auditors, Alderman Clough and Mr. Bernard Cowan, were unanimously re-elected and cordially thanked for their services to the Society.

Local Secretaries.

The following Local Secretaries were re-elected :—

W. B. Havelock, Brocklesby, Lincolnshire.
William Forbes, Woodhouse Lane, Leeds.
Bernard Cowan, Westoe, South Shields.
William Fleming, Tudhoe, Durham.
James Barrie, Torrington, North Devon.
Francis Mitchell, Woburn, Bedford.
Edward Shipley, 20 North Road, Darlington.
Frank Hull, Lillieshall, Newport.
W. A. Forster, Belgrave Lodge, Pulford.
W. Tomlinson, Clumber, Worksop.
A. J. Forrest, Thorney, Peterborough.
William Elder, Cholmondeley, near Malpas.
Thomas Roberts, Midhurst, Surrey.
Edward Davidson, Haydon Bridge.
Robert Coupar, Ashford, Co. Galway.
W. Storie, Highclere, Newbury.
John Mitchell, Strid Cottage, Bolton Abbey.
Chas. Hankins, Bury St. Edmunds.
D. A. Glen, Bedgebury Park, Goudhurst.
A. T. Gillanders, Park Cottage, Alnwick
George Clark, Haltwhistle.
Thomas Lewis, Fair Oak House, Roath Park, Cardiff.
Capt. Davidson, Harrogate.
D. C. Legard, Lincoln.

Judges of Essays.

Messrs. Joseph S. Gray, York; John Maughan, Jervaulx; and A. C. Forbes (the latter in place of Professor Fisher) were appointed judges of essays for the coming year.

Forestry Examiners.

The forestry examiners were appointed as follows :—Messrs. W. Forbes, Swinton, Masham; W. B. Havelock, Brocklesby; and Principal J. Smith Hill, B.A., Aspatria.

The Prize Winners in the Essay Competition.

The judges on the competition in essay writing on forestry subjects reported the results. The subjects were :—1. "On Hedges; Preparation of the Ground, Mode of Planting, and their Proper Treatment, with Ditches alongside." 2. Confined to assistant-foresters under 27 years of age (President's Prizes). "On the Formation for economic purposes, and treatment from planting up to maturity of a crop of Larch." The following were the awards made :—

Subject No. 1.—

Thomas Conway, Oaktree Cottage, High Legh, Knutsford, *Silver Medal.*

George Mowatt, Assistant Forester, Alnwick, *Bronze Medal.*

Subject No. 2.—

R. J. Wylam, Lambton Park, Durham, £2 2s. 0d.
A. C. Dummie, Park Cottage, Alnwick, £1 1s 0d.

Gift to the Society by the Hon. Mark Rolle.

The President proposed a very cordial and hearty vote of thanks to the Hon. Mark Rolle, Stevenstone, Torrington, Devon, for the very handsome gift he had presented to the Society of a collection of forest and ornamental seedlings and transplanted fir trees, which were exhibited in the forestry section of Park Royal show. The collection consisted of 163 different specimens of conifers, etc. Several of the members had seen them, and had been struck with the most wonderful way in which the trees were displayed. He had heard it said that these exhibits alone were worth going all the way to Park Royal to see. (Cheers.) He had much pleasure in proposing that the Secretary be instructed to write to the Hon. Mark Rolle saying how much indebted the Society was to him for the valuable gift. (Cheers.)

Mr. Gillies seconded, and Mr. Havelock supported the motion, and this was unanimously agreed to.

The question of how best to dispose of the trees was remitted to the Council, with full power.

Next Year's Business.

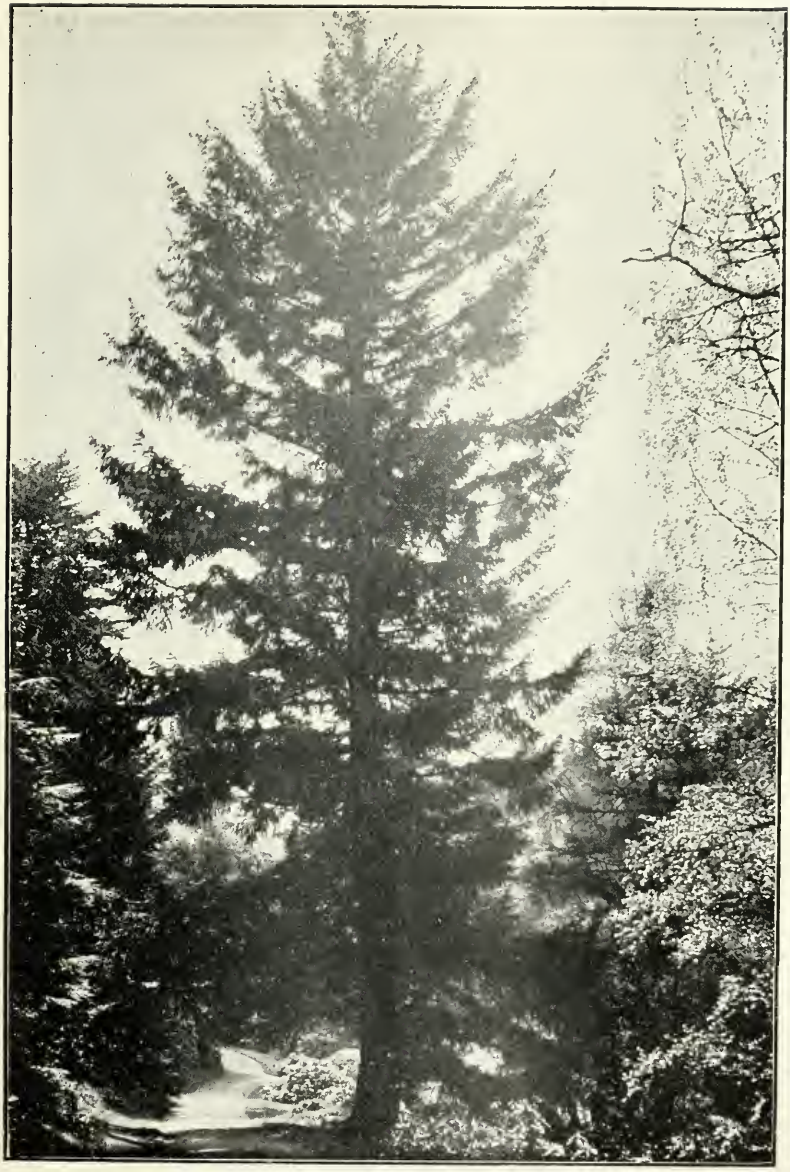
The question of subjects for the essays for 1904-5, along with suggestions to hold next year's meeting in Germany, at Exeter, and in Ireland were passed over for the Council to deal with.

A vote of thanks to the retiring President, who had so worthily filled the office of Chairman, ended the business meeting.

VISIT TO DURRIS ESTATE, LOWER DEESIDE.

The sun shone brilliantly on the early morning start made with the excursion to the estate of Mr. H. R. Baird, of Durris, on Wednesday. Breakfast had been served at all the hotels at seven o'clock, and by eight all were in readiness for the drive. Four large four-in-hand char-a-bancs were in waiting at the Palace Hotel entrance, and the members, after being supplied with sprigs of oak in true arboriculturist fashion by Mr. Edward Davidson, the assistant secretary, took their seats. In the first carriage there were seated the ex-president, Mr. George Marshall; the secretary, Mr. John Davidson; Col. Beadon and Mr. Coroner Graham, past-presidents; Mr. John Crozier, head forester at Durris, who acted as guide to the members. At a signal from the assistant secretary, who occupied a seat on the box of the leading four-in-hand, the vehicles drove off by way of Union Street, Holburn Street—giving the members a good view of the city—and across the Bridge of Dee, and into the country by the south Deeside road. The morning was bright and sunny, and as the horses bowled along at an easy pace, the woodlands on the lower reaches of the Dee came into full view. The picturesque scenery came in for unstinted admiration, and who could better judge the sylvan beauties that Nature has scattered with so bountiful a hand here than the members of our Society? The trees that skirt the way were freely discussed as to their ornamental and commercial value and their actual names and species. Places of interest were pointed out, including Banchory-Devenick, Cults, Bieldside, Culter, Milltimber on the right, and Blair's College (the Roman Catholic Seminary for Scotland) on the left. At the end of the ten-mile journey, which was greatly enjoyed, the party were met at the entrance gate of Durris House policies by Mr. Baird. Mr. Thomas Braid, the factor on the estate, and several other estate employés and officials were also awaiting our arrival, and we immediately commenced a tour of the beautiful policies.

Passing along the main road, the party were shown the first of the Douglas firs which abound on the estate. The pines were planted four years ago and were now eight years old. The best trees were fifteen feet high, and were planted partly for game and



Pseudo tsuga Douglasii (Douglas Fir).

Height, 106 feet; Girth at 5 feet, 12 feet; Cubical Contents, 304 feet; Soil and Geological Formation, Thin layer of Loam, Boulder Clay, Gneiss.

foresight and keen business capacity for land and general estate improvement that Durris owes its present standing. He was succeeded by his son Alexander, who was responsible for the introduction and planting of the extensive collection of exotic trees and shrubs for which Durris has long been famous. In 1871 the estate was purchased by Dr. James Young of Kelly (of paraffin oil fame), and a few years after his death was purchased privately by the present proprietor, Henry Robert Baird, who has continuously prosecuted a policy of advanced estate improvement in all departments.

The policies have been laid out with great taste and contain an extensive collection of deciduous and evergreen trees and shrubs; many of these, however, have proved unsuited to our northern climate, and with the exception of the North American imports, few others of the former are likely to be of much practical benefit to British planters. The Douglas Fir of Oregon takes precedence of all others, and owing to its free growth, freedom from disease, and wonderful adaptability to a wide range of soils, sub-soils, and elevations, has proved to be a valuable asset to our limited number of commercial timber-trees. Its timber, when sylviculturally grown and matured, is of excellent quality, takes on a beautiful polish, and is especially suited for house construction. Menzies Fir takes second place, and resembles the Douglas Fir in its adaptability to soils, etc. It braves the elements on the lower slopes of the Grampian hills, where spruce and Scots fir refuse to make headway, but its timber is much inferior to that of Douglasii. Amongst the varieties of the Silver Fir the following all do well here, and form clean cylindrical boles: Abies Nobilis, A. Magnifica, A. Lasiocarpa, and A. Grandis, and like the exotic spruces yield large quantities of fertile seed.

Given below are the measurements of a few of the finest specimens, most of which have been sylviculturally grown, and have stems clear of branches.

	Height.		Girth at 5ft.	
	ft.	in.	ft.	in.
Pseudo-Tsuga Douglasii (Douglas Fir)	106	0	12	0
,, ,, ,,	96	0	10	6
,, ,, ,,	110	0	7	3

	Height. ft.	in.	Girth at 5ft. ft.	in.
Pseudo-Tsuga Douglasii Tsuga Albertiana	85	0	5	0
,, ,, ,,	63	0	6	5
Picea Menziesii - - -	87	0	6	0
,, ,, - - -	85	0	6	0
,, ,, - - -	82	0	5	9
,, *Orientalis* - - -	61	0	6	3
,, ,, - - -	60	0	5	8
Abies Fraserii - - -	62	0	4	9
,, *Grandis* - - -	82	0	9	6
,, *Lasiocarpa* - - -	74	0	7	6
,, ,, - - -	72	0	7	0
,, *Magnifica* - - -	80	0	6	6
,, *Nobilis* - - -	80	0	8	3
Larch - - - -	100	0	10	6
,, - - - -	109	0	8	10
,, - - - -	106	0	8	10

The commercial woods cover an area of nearly 4000 acres, and are composed chiefly of Larch, Scots Pine and Spruce, while Douglas Fir and Menzies Fir have been freely planted in the younger plantations. Hardwoods have not been planted extensively, and the result attained generally is not encouraging. With the exception of the Dee Valley, which is composed of light sandy loam resting on gravel, all the remainder of the estate rests on gneiss, the soil alternating from a rather light loam on the low ground to a stiff boulder clay at higher elevations. Larch, Spruce, Douglas, and Menzies Fir all do well on the cool bottom; but Scots Fir, although making rapid growth in its younger stages, does not continue its rate of growth, and may be said to have reached its maximum of value by the time it has reached its seventieth year.

Sylvicultural Method of Working.

Clear felling is adopted in all mature woods, but in several of the immature woods, which have become broken in canopy through various causes, a further thinning out of the weaker stems was considered advisable, and the ground afterwards filled up

with Douglas Fir, forming a two storeyed combination. The parts at first operated on were under Larch and hard woods, and these have turned out successfully. It is now intended to extend the practice to the Scots Fir plantations of the same class. Owing to the prevalence of pine weevil it is necessary to allow the old roots to decay, and an interval of not less than four years must elapse before the ground can safely be re-stocked. Aberdeen is the chief market for soft woods, and there is a steady demand for all classes of timber. The box making, fishing, granite and other industries absorb almost the entire output of wood in the North Eastern Counties, and wood merchants experience an increasing difficulty in procuring Scots Fir of sufficient size for the requirements of their trade. Prices generally range as follows where the wood is within reasonable distance of a railway, and the trees sold standing:—Larch, 10d. to 1s. 2d.; Scots fir, 6d. to 8d.; and Spruce and Silver for 5d. and 6d. per cubic foot. Pine woods on this estate have proved a remunerative investment, and recent sales show a nett return in ground rental far in excess of the actual returns from cultivated land in their immediate vicinity.

In the tour of inspection, which lasted till about one o'clock, the magnificent fern-leafed limes, fine specimens of the arthro taxis laxiflora, of Albertiana, which are reared by thousands, of variegated Wellingtonia, of self-layered thuga gigantea, etc., were seen and praised. A sawmill was seen at work, where a trunk of Douglas Fir was split up, revealing the remarkable growth of 14 inches of red or hard wood (the serviceable part) in an 18-inch deal. The extensive and highly cultivated nursery was then visited, and came in for the highest encomiums of the members of the Society.

On the invitation of Mr. Baird, the whole company was entertained to lunch in a large marquee erected on a beautiful tree-sheltered park near the house. Mr. Baird himself presided, and was accompanied right and left by the chief officers of the Society. An excellent lunch was prepared by a royal purveyor from Aberdeen.

The Chairman said there would be no speeches, but there

Section of Douglas Fir in a 14 acre plantation, planted in the Spring of 1900 with four year old plants after a crop of Scots Fir.

would be two toasts, and the first toast was "His Majesty the King." (Cheers).

The toast was loyally honoured.

The CHAIRMAN then said: Ladies and gentlemen, the last toast will be "Our Guests," and in one word I say welcome and glad to meet you. This is not the first time I have met members of your Society—a Society, I believe, which does invaluable work in the highest interests of forestry—and I may tell you that your work has been reflected even in this far north country of ours. I am no orator, but I should like to express the sincere wish that your researches and studies in the subject that so profoundly interests us may be attended with the greatest success. (Loud cheers).

The PRESIDENT: Ladies and gentlemen, Mr. Baird has said that there were to be only two toasts to-day, but I am sure you will all agree with me that it is necessary to add a third—(loud cheers)—and the toast I have the honour to propose, ladies and gentlemen, is "Health and prosperity to our friend Mr. Baird." (Loud cheers). I am sure I may safely say on behalf of this company that we never saw a finer nursery, prettier ornamental trees, better timber, or an estate better kept than Durris. It comes, I am sure, as a surprise to a great many of us in England when we come here and see the magnificent conifera on this estate. (Cheers). It is impossible to realise that in this district trees can grow with so much vigour as we have seen here this morning. (Cheers). I must refer to the great impression the Douglas Firs have made upon us all. (Cheers). Mr. Baird has been very well advised in planting the Douglas Firs, looking to their profit. Coming to the nursery, I think we have seen one of the finest private nurseries we have ever seen. (Cheers). If arboriculturists living in Scotland imitated Mr. Baird's example and planted the coniferæ on their estates we would then see arboriculture and sylviculture in a better position than at the present moment. (Cheers). I give with all the honours the health of our most generous host of this morning. (Loud cheers).

The toast was most enthusiastically pledged, the company rising

and singing "For he's a jolly good fellow," and giving three hearty cheers. A call for one more cheer for "The wife and bairns" was most heartily responded to.

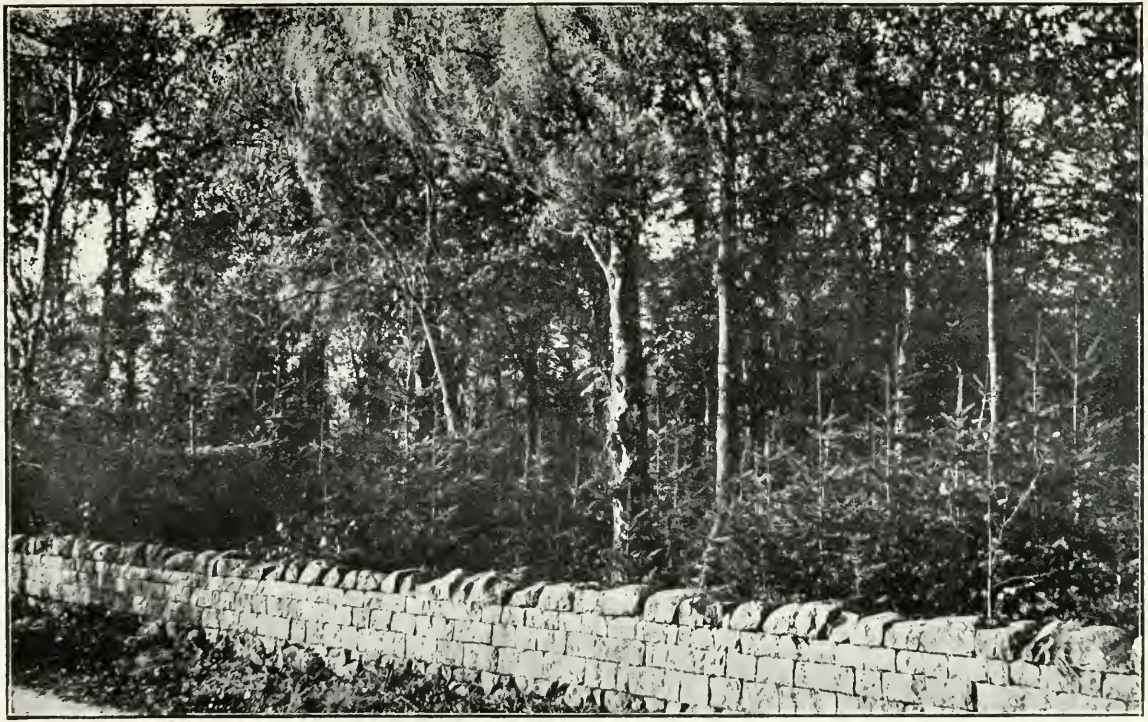
Mr. BAIRD, in a word returned thanks, and the company recommenced their journey through the woods. The gardens were visited. Under the guidance of Mr. Andrew Reid, the head gardener, orchid houses (of which there are three), a melon house, tomato house, three vineries, peach house, carnation house, and the stove houses were inspected, and came in for a large share of admiration. The terraced gardens, with their beautiful devices in beds of flowers, their chains and arches of roses and trailing plants, and other striking features were also seen in the finest bloom.

Assembling later in the afternoon at the factor's house, light refreshments were served by Mrs. Braid, Mrs. Crozier, and several young ladies; after which Mr. MARSHALL called upon Mr. R. Mc.Gibbon, head forester to Lord Fitzwilliam at Wentworthwood House, Rotherham, to propose a vote of thanks.

Mr. MC.GIBBON said he was sure there were gentlemen there who could have spoken more freely than he. He noticed several representatives from the largest estates in England present, and he was sure they would better say what he had to give voice to. However, they were all agreed that they had that day seen the finest wood and the finest trees, both from a commercial and an ornamental point of view, it had ever been their lot to look upon. (Cheers). He had the honour to propose a hearty vote of thanks to Mr. and Mrs. Braid for their kindness and hospitality. (Loud cheers).

Mr. BRAID briefly returned thanks, and said it had been a great pleasure to them to entertain those whose interests were so much akin to their own at Durris.

The party then drove to the western part of the estate, and were shown some Scotch Fir, Larch, etc., and, returning by the Crathes Bridge and north side of the Dee, arrived again in the city at 7-30 p.m., and immediately dressed for dinner.



Douglas Fir in old hardwood plantation.

Planted four years ago with four year old plants, at 5 feet apart, and now from 9 to 12 feet in height.

THE ANNUAL DINNER.

The annual dinner was given in the Palace Hotel on the evening of Wednesday, August 17th, the President (Mr. GEORGE MARSHALL) in the chair, there being present as guests of the society—Ex-Lord Provost Fleming, Dalmuinzie; Mr. T. Braid, factor, Durris; Mr. John Clark, head forester to Lord Aberdeen, Haddo House; Mr. John Crozier, head forester, Durris; and Mr. W. Deuchar, passenger superintendent, Great North of Scotland Railway, Aberdeen.

A *recherche* repast was partaken of, after which the CHAIRMAN in giving the toast of "The King," said that they were greatly indebted to His Majesty, as a Society in many ways, for whenever they went to a Royal property that property was always open to them. They were looking forward to their visit next day to Balmoral, where they should again be honoured with the permission to visit the place. (Cheers).

The toast was loyally pledged.

Mr. B. COWAN, South Shields, gave the toast of "The Lord Provost, Town Council, and City of Aberdeen" in a very eloquent speech. The Society had for the last 22 years visited many great towns and cities in the United Kingdom, but he understood that never had the members turned out in greater numbers than to visit the city of Aberdeen. (Cheers). Amongst the many societies that had visited the city he was sure none felt prouder of its reception than the Arboricultural Society did. The citizens had extended to them the kindest of welcomes, and nothing could equal the courteous hospitality they had received from Mr. Baird that day in their visit to the classic ground of the arboriculturist and sylviculturist at Durris. (Cheers). He went on to speak of the well-known benefactor of Aberdeen—the late Mr. Charles Mitchell of Jesmond Towers, Newcastle. (Cheers.) He had done both for Newcastle and Aberdeen what many an Aberdonian would still be proud to do. He had left an undying record of his generosity to the city of Aberdeen in the Mitchell Tower at Marischal College, and he had done as much for the coal metropolis of England commercially as any one he (the speaker) knew.

(Cheers). He concluded by expressing the wish that the city which had sent forth so many distinguished sons would go on and prosper. (Cheers).

Ex-Lord Provost FLEMING responded. He had been designated Lord Provost, but he was sorry to say there was ex before his name now. Two years ago it would have been his pleasure to reply to the toast in that capacity. He thanked the Society for the honour conferred on him in asking him to be present. He had been for 20 years a member of the Scottish Arboricultural Society, and he took a great interest in arboriculture indeed, and although fate had called him to cut down and desecrate those beautiful samples of wood which were the outcome of the foresters' skill—he might say that he often did it almost with tears. (Cheers). The Lord Provost was taking a much-needed rest at present up the beautiful Deeside, and he would not wonder but that he would join them at Balmoral next day, for he was staying at Glengirnoc there on holiday. They coupled his name with the Town Council. Well, the Town Council was an admirable one. They had no Tammany Rings in that part of the world—(cheers) The Aberdonians always looked too well after their own interests for that, and it was a question with them as to who should do the most for the benefit of the community (Cheers). Their city was a handsome and substantial one. It was sometimes called "cold grey," and they would hear the American calling it the tombstone city. (Laughter). Well, they had no objection to taking orders in that line. (Laughter). In a gazetteer published some 20 years ago it was said that the chief exports of the city of Aberdeen were granite and brains. (Cheers). He believed the former at the present moment was the chief import. In order to enable them to supply enough granite they had to import a great deal from other countries, but they did not import brains. (Laughter and cheers). They were all home grown. (Cheers). He was very pleased to see so many Englishmen in the north. He hoped they had enjoyed themselves that day for he was sure they would the following two days at Balmoral and Haddo House. (Cheers).

Colonel BEADON proposed the health of the proprietors whose estates they had visited and intended to visit. This, he said, had

always been the custom of the Society, and he was sure that at that great gathering they could not do better than propose the health of the gentleman, the visit to whose estate they had so much enjoyed. (Cheers). Not only had they been royally entertained at luncheon, but he had given them his own valuable time in the forenoon, and his agent's and his forester's the whole day. (Cheers). He hoped these latter gentlemen had not lost the time, but that they had gained something from the men they had met. That day they had seen things done really, practically, and well. (Cheers). They were going to Balmoral to-day. A telegram had been received from Mr. Michie, His Majesty's factor, apologising for his absence from that dinner, but he was sure they would get a most kindly and cordial reception. He coupled the toast with the name of Mr. Braid, Durris, and Mr. Clark, Haddo House.

Mr. Braid, in the course of an interesting reply, thanked them on behalf of the proprietors for the way they had received that toast. He thanked the Society, for Mr. Baird, for having honoured the estate of Durris with a visit, it being the first visit of the Society to Scotland after a long absence and only the second time it had crossed the border. The estates they had selected were typical estates and typical landlords. The latter were one and all philanthropists of the first water. (Cheers). Some additional facts about Durris might be interesting. (Cheers). Mr. Baird went to Durris in 1890, so that he had held the ownership for 14 years. They had been indebted to former proprietors, however, principally Mr. Mc.Tear, for a great deal. It was the duty of every one who owned an estate to work, not only for himself, but for those who came after him. (Hear, hear.) Had Mr. Mc.Tear not planted those trees they would not have been what they were. (Cheers). He thanked the company for the way they had received the toast. (Cheers).

Mr. Clark, also in response, apologised for the absence of Mr. Smith, the factor at Haddo House. He eulogised the Durris estate, and said it was a pity the Society had gone there first, for it was the place he admired above all other places in the United Kingdom. Balmoral stood next, still there were things that would interest them at Haddo House. (Cheers).

Mr. GILLANDERS, in giving the toast of "Forestry Education,' said: Three years ago I had the honour to propose this very same toast at our Peterborough meeting. But within that comparatively short space of time forestry, or rather efforts to improve "forestry education," have made considerable progress. I must now, therefore, adapt my remarks to the changed conditions. First of all, we have had the Government's Departmental Forestry Committee, and, as a result of its suggestions, lectureships and other facilities for the improvement of forestry and the advancement of forestry education are given. (Cheers). Without any political bias, I am quite sure I reiterate the sentiments of this Society when I say that we are very grateful indeed to the Government for their generosity. (Hear, hear). Then, again, we have just lately had the Royal Agricultural Society of England arousing a keener interest in forestry and the promotion of forestry education by the holding of an exhibition at Park Royal. The exhibits were of a highly educational character throughout. I am glad to say the exhibition was very much appreciated, not only by the Council of the "Royal," but by landlords and land agents, together with the public who saw it, and also by the English Press, who have highly eulogised its educational features. In view of these improved conditions I venture to think that the task I have to perform in connection with this toast is to consider how we are to take advantage of these facilities, and how we are to advise and train our young men so that they may derive every advantage from them, and, at the same time, be thoroughly practical men for the varied requirements of an estate forester. To begin with, I would suggest the old-fashioned method. Get hold of strong boys who have received a good, sound elementary education and teach them to work—teach them the use of their hands—in such a manner as to deter them from cultivating false ideas of their own importance. (Laughter and cheers.) At the same time, I would suggest that they get every opportunity to take advantage of the higher educational facilities simultaneously with their practical training. This, of course, can best be done according to the facilities afforded in the district, and by annually attending during their term of

apprenticeship something like the six weeks' course of lectures now given at the Glasgow University. This seems a very good method, inasmuch as it does not take up very much time, and it is a kind of intellectual holiday. After this combination of practical and theoretical apprenticeship and education, I would be inclined, so far as circumstances would permit, to give him an opportunity of going abroad, on easy and cheap terms, and learn the sylvicultural methods which have been adopted on a large scale there, with a view to broadening his mind and applying those methods so far as that is possible to the varying requirements and prospective demands of this country. I would also advocate that the young forester be trained in laboratory work, for without such training he would never be able to take part in original research nor appreciate or understand scientific investigations. Still further, in the lecture room the young men can be taught to realise that a tree is something else than a commercial product. He must be taught to realise that a tree is a living biological organism, acting and reacting in accordance with its environments; as, for example, in response to certain conditions of light whence comes the scientific explanation of the true principle of "mixing." Again, the young forester must be taught to understand and fully estimate the true value of certain natural laws. For example, we see that throughout the whole realm of Nature there is the law known as "the struggle for existence." Now, in producing timber, by deferred thinning in young woods we are simply compelling Nature to adhere to her own laws, thus giving us "branch suppression." And, now, in case I may be misunderstood, I should like to say that in advocating this higher education, I have no intention of producing a set of foresters who would shut themselves up in a laboratory and work all day and night long with microscope and other apparatus. On the contrary, I believe in a thoroughly practical man with a breadth of culture and depth of mental calibre sufficient to cope with the developments of the time. I believe, also, that we have arrived, as it were, at a stage when to some extent we must recognise a broad distinction in forestry education between the young man who means to be a practical

estate forester and the young man who aspires to become a professor or lecturer. Of course, it does not follow that the practical forester may not become a professor or be an original investigator of scientific forestry research, but this must be settled by taste or predilection. In a general way the distinction is obviously necessary. However, I consider that the more highly educated forester will better understand the original investigation of the professor, and, on the other hand, the professor will get the best assistance from the highly educated forester. Hence, in future, if forestry is to be considered an exact science, it will only be advanced in proportion as the professor and the practical man work harmoniously and congenially together. (Cheers).

Mr. Henry, with whose name the toast was coupled, in reply said—It is only fitting, since the toast of Forestry Education has been proposed by Mr. Gillanders, a "professor" of sylviculture, that it should be responded to by a student like myself. I have attended lately the lectures at the famous school of Nancy, and joined in the splendid educational excursions with the young French foresters into all parts of France. I have been convinced of the great advantages resulting from a college education in the science and art of forestry. It is true that as a practical art, forestry can only be learnt in the woods; but the effects of a scientific training are far-reaching. It must not be forgotten, that though it is sometimes the foolish custom to sneer at Professors, yet the whole modern system of French forestry was evolved by the Professors at Nancy, and did not emanate directly from the ordinary members of the forest service. The Professors were able to take a wider outlook : they co-ordinated the results and observations of the practical men : and they substituted in their pupils accurate observation and experiment for rule of thumb methods. Looking around at the system of forestry in this country, it evidently lacks a scientific basis : and just as there is a French scientific system of forestry, and a German one, and an American one, we may look forward to the gradual evolution of a system adapted to the requirements of the soil, climate, and economic conditions of these islands. This improvement must come from the actual foresters and "professors" of forestry in this country. So far as I have seen the material to be educated in

scientific forestry is excellent. The young foresters are keen, intelligent, and eager to learn. What is wanted is to add on to their practical training a college education. Training by professors gives precision to thought and introduces the fruitful ideas of measurements, statistics, accurate observation, and purposeful experiment. The young forester, after two or three year's practical work in planting and tending woods, should have an opportunity of going to college for at least a year : and two years would not be too much. With moderate fees, the college course need not be expensive ; and it should become the business of owners of moorlands to provide facilities for their young foresters to get this college training. The advancement of forestry in this country, in my opinion, will depend largely on the general adoption of such a plan as I advocate. The country is being continually alarmed by the reports of the decay of industries due to lack of scientific training : we are told that the Germans are beating us in many directions for this reason. It should be the business then of enlightened proprietors and of the State to see that an opportunity of cheap but good scientific training should be given to the splendid body of young foresters throughout Scotland and England. (Cheers).

Sir Hugh Beevor proposed "The English Arboricultural Society," and in doing so, said that they had just had given them the toast so ably proposed of "Forestry Education." That was one of the objects for which Mr. Davidson got the Society founded. (Cheers.) A very large part of that, however, was perhaps being taken out of the hands of the Society, because university centres and County Councils were providing lectures, he believed at many places. It was a great satisfaction to them that one of their members who had given valuable contributions to their *Transactions*—he meant Mr. Forbes—had been appointed a lecturer at the Technical Science College of Durham and Northumberland. They took that as a compliment to themselves. (Cheers.) He considered that the work of the Society loomed larger every day. He imagined so far as that Society took part in examinations that those examinations would be of a thoroughly practical nature, and he hoped that the many able men who were associated as members of the Society and who had special

knowledge, whether in the rearing of plants or the raising of woods, would give them the benefit of their experience. He coupled with the toast the names of Mr. G. Marshall, ex-president of the Society, and Mr. John Davidson, secretary. (Cheers).

Mr. Marshall, in reply, said that although he had pleasure in his name being associated with that toast, more especially when it was also coupled with the name of his old and tried friend, Mr. Davidson, he felt that he was somewhat of an impostor in rising before Mr. Davidson, because he felt that what he had been able to do for the Society had been very small as compared with what Mr. Davidson had done. He thought that in recent years the Society had aroused a very great deal of interest in that very important subject of forestry. (Hear, hear.) They had travelled about from place to place, and in addition to visits to England and Scotland, they had gone abroad and seen what was being done on the Continent. He had lately returned from the Continent, having been there with the Scottish Arboricultural Society, and he ventured to say that what he had seen would be well worth the while of that Society or any private individual going to see. There was at the part he visited an immense tract of land where the people simply got their living through dealing in timber. The timber industry there was a very great industry. Directly the trees were cut down, other plants were put down, and went ahead in a most wonderful way to form the forests of the future. He thanked them for the manner in which they had responded to the toast. (Cheers.)

Mr. Davidson said he had to thank them very heartily for the way they had received the toast. He was glad to be there that night, if for nothing else than that he had the comfort of feeling a great measure of the reponsibility taken off his shoulders so far as the success of the Society was concerned. He was glad that that Society was now becoming in a measure a solid body, and he could only hope that it would keep on growing in that permanent manner that had characterised it during past years. (Cheers). He thought there had been a quiet influence at work not only amongst the general members of the Society, but in political circles and amongst the governors of the country in relation to that Society and the Royal Scottish Arboricultural Society. He ventured to

predict some twenty-two years ago, when they were on a united excursion with the Royal Scottish Society, that the day would speedily come when the Government would take a deeper interest in the science of forestry. The Government had now recognised that it was a very important subject, and would take a very remarkable lead in the recovery of a very great deal of the prosperity of this country which had been so far lost. (Cheers). They had never had so many architects as they had at present, but it would puzzle many of them to say what kind of architecture would be handed down to posterity as the architecture of the twentieth century, so mixed was its character. Arboriculturists hid and screened the deficiencies of the architect—(hear, hear)—and he hoped that it would be handed down to posterity that that had been an arboricultural century. (Laughter and cheers). With reference to what the Government had done, he did not know that he was pleased with every detail. They had purchased, he believed, an experimental plot in Scotland, and he ventured to suggest that the Royal Scottish Arboricultural Society should be very careful in agreeing to the terms of the Government. They ought to be very careful in allowing the Government to plant anything in Scotland, because they had some historical portions of the country that really should not be planted—Arthur's Seat for instance. Neither should the deer forests or the golf links be planted. (Laughter). Without any disrespect to the Royal Scottish Society, he thought they in England were better prepared for forestry education than they in Scotland were ; for they had already suitable ground prepared with houses already built to receive the students. (Laughter and cheers).

Mr. Gray proposed "Kindred Societies." He said he gave this toast with the utmost personal pleasure, and he was sure they would cordially adopt it. Deep down in the hearts of the members of the English Arboricultural Society and the Royal Scottish Arboricultural Society he was convinced there was something very much higher and more noble than any feeling of personal antagonism. (Cheers). He felt sure the members of the Scottish Society looked with pleasure on their visit there. (Hear, hear). He thought that in the interchange of visits there was something which went to cement that union which, two centuries ago,

went to make England and Scotland into Great Britain. The Royal Scottish Society had a more dignified title than they, but they felt no jealousy about that, although willing that His Majesty should confer the same title upon them. (Hear, hear). They rejoiced that they were both working in a common cause. (Cheers). There were other societies which he might mention, such as that in the Isle of Man, the society in Ireland, the society in the United States, and also that of France, all working for the promotion of forestry's highest and best ideas. (Cheers). He coupled the toast with the name of Mr. David Laird, ex-president of the Royal Scottish Arboricultural Society.

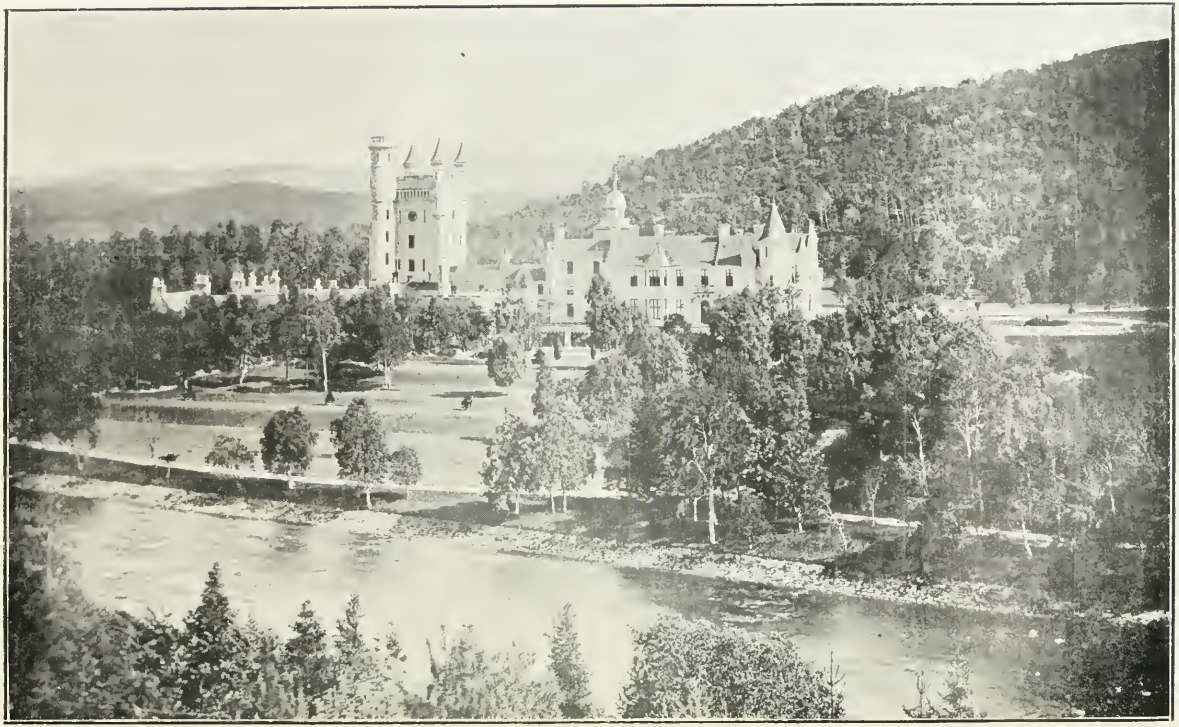
Mr. Laird, in reply, thanked the gathering very heartily for the cordial manner in which they had proposed the toast of kindred societies. He thought a great deal more of the interchange of opinions between Scottish and English arboriculturists might take place. That was the second visit of the English Arboricultural Society to Scotland, and he hoped it would not be the last. (Cheers).

Mr. Havelock gave "The Local Committee." The arrangements of that day, he said, had been splendid, and they had to thank the local committee for that. He was sure they had all greatly enjoyed their visit to Durris. (Applause).

Messrs. John Crozier, Durris; John Clark, Haddo; and A. T. Gillanders briefly responded.

Presentation to the Retiring President.

At the conclusion of the above proceedings a very interesting presentation was made to Mr. George Marshall, the retiring president. Ever since Mr. Marshall joined the Society and took part in its meetings he has been highly esteemed by all the members. His term of office having expired, his friends took the opportunity of opening a subscription list, and fixed the amount of subscription. As a result, the whole of the members present attached their names, and the neat sum of ten guineas was



BALMORAL CASTLE.

handed over to Mr. Marshall by Colonel Beadon, who, in the course of his remarks, said the Presentation Committee would simply hand the money over in cash, and leave what form it should be invested to Mr. Marshall's own personal wishes.

Mr. Marshall returned thanks, and was accorded a rousing cheer.

The amount collected has eventually been spent on a silver bowl (old Irish pattern), bearing on one side the following inscription :—

Presented to
George Marshall,
By his friends, the Members of the English Arboricultural Society,
August, 1904.
President, 1902-1904,

and on the opposite side of the bowl there is the crest and motto of the Society.

VISIT TO BALMORAL.

On August 17th the third day's proceedings of the English Arboricultural Society took the form of a journey to Balmoral Castle, the highland residence of His Majesty the King, and its surrounding forests. The members and friends left in special saloons attached to the 8-5 a.m. Deeside train for Ballater. The railway journey commenced in beautifully bright weather, and the scenery by the river Dee and all along the valley through which the railway runs was much admired, and provided great pleasure to the members of the Society.

Four char-a-bancs and an open carriage were in waiting in Ballater Square to convey the party over the intervening nine miles ride to Balmoral. Mr. John Michie, the King's factor, met and welcomed the members of the Society.

All were soon seated in the vehicles, and the ex-president and acting chairman (Mr. Marshall), Colonel Beadon, Mr. Graham, and Mr. Davidson (the senior secretary) took their places in the first carriage, accompanied by Mr. Michie.

Looking from Ballater Square the arboriculturists viewed with great interest the pine-clad heights of Craigendarroch on the north side of the railway. The coaches set off at a good pace, and swung round towards the hill into Braemar Road, and the rather toilsome steep—the Darroch Brae. The deep fringes of English oak on the left and the birches stretching away into the hill on the right were admired and commented upon.

As the char-a-bancs rose higher and higher up the hilly highway, glimpses of the silvery Dee were obtained through the pretty foliage. By and bye Lochnagar came into full view, and the admiration by the visitors of the hills Byron has made famous, was most marked, and a considerable portion of the journey was devoted to the praise of their grandeur. The cloudcapped heights were, on a nearer view, seen to have retained, in their rocky clefts, the snows of the previous winter. Surprise was expressed at the great altitude at which Scots firs grew and flourished. The junipers, which grew in abundance on the barest of the roadside slopes, were noticeable in the view of the arboriculturists from the fact that they had apparently been from seeds strewn by birds.

A short halt was called at Coilachriech Inn to water the "horses," and soon thereafter the party were nearing the Balmoral gates. Abergeldie Castle, where the children of the Prince and Princess of Wales were then staying, was of special interest, and Craiggowan, Crathie Parish Church (where His Majesty the King worships), and other special features in the neighbourhood, absorbed the attention of the whole party.

Balmoral Castle, for so many years the Highland home of Queen Victoria, and now of His Majesty King Edward VII., is beautifully situated among the pine-clad hills on the higher reaches on the river Dee some fifty miles from Aberdeen.

In His Majesty's absence, the Castle is shown to visitors only on the presentation of a written order, but to the English Arboricultural Society the extensive policies were thrown unreservedly open. The property consists of about 10,000 acres, which belonged formerly to the Earl of Fife, but which, in 1852, became the property of the Crown by the payment of £32,000. The Castle itself, which is built of light-grey Aberdeen granite was erected by the Prince Consort, the King's father, at his own expense.

Near by is Crathie Church, where the Royal Family attend divine service, and a mile and a half away, nearer Ballater, the railway terminus, is Abergeldie Castle, a favourite "shooting box" and summer residence of the Prince of Wales and particularly of his boys, the young princes. The surrounding country is of great beauty, and Balmoral Castle itself resembles a gem in a most attractive setting. At one end of the oblong structure is an exceedingly picturesque tower, about 100 feet in height, commanding an enchanting view. More than 100 persons can at one time be comfortably lodged in Balmoral, and it has frequently been the scene of regal hospitality.

Within a pistol shot of the Castle the silvery Dee sweeps from the Grampian Hills, and after taking the falls at Lynn-on-Dee, meanders down delightful dells. Its whole course of ninety miles offers a constant series of enchanting views. The neighbourhood abounds in opportunities, not merely for shooting, but for enjoyable excursions among the Highlands, particularly to that grand old mountain Lochnagar, which is seen towering to a height of 3800 feet, celebrated by Lord Byron and called by the late Queen Victoria her mountain jewel. From its summit fully one half of Scotland is outspread before the vision of the enraptured traveller.

In the fascinating science the Society exists to promote, the members saw much to interest them at and about Balmoral Castle. Here were seen with pride, the beneficial results of the deep interest taken in sylviculture by the late Queen Victoria the Good and the Prince Consort. It was during the life of the latter that the woodlands at Balmoral were designed, and their alignment and planting were most skilfully carried out under his immediate supervision and control. His Majesty the King has followed closely in the footsteps of his illustrious parents, and at the present time extensive improvements are being carried out on the estate. New garden plots it may be mentioned, are being laid out on a new plan to the east of the Castle.

Craig-Gowan hill, which, after a short inspection of the stables and gardens, was reached by the party, rises to a considerable height on the south side of the Castle. Entering by the gate at the base of "Michie's path" on the north side, the members sauntered leisurely up the steeps. On the northern slopes of this hill there are some 200 acres of birchwood which is now past

maturity and fast going to decay. It is being gradually replanted with a variety of trees, among which the newer conifers are a leading feature, and so far as the experiment has gone, promise to establish themselves and prove a success.

Amongst those which are blooming, beside larch and Scots fir, are *Abies alba*, *A. alcoquiana*, *A. Douglasii*, *A. nigra*, *A. orientalis*, *Picea concolo*, *P. magnifica*, *P. nobilis*, *P. pectimata*, *Pinus cembra*, *P. montana*, *P. monticola*, *P. rigida;* and of deciduous trees, Norway maple, various birches, wild cherry, laburnum, mountain ash, alder, willow, plane, and beech, are thriving best. Many others have been tried but those named give most promise of success. The south aspect of Craig-gowan was planted with Scots fir by the late Prince Consort in the spring of 1851, and again two years later, the first planting having been much damaged by game. The plantations have thriven well as a rule, and the improvement is very marked every season.

Some of the more interesting specimens seen and noted during the exploration of the woods may be remarked upon in detail. To the left of the entrance at the foot of the hill there is a *Picea concolor*, which was planted 22 years ago at 3 feet. It is now 22 feet high, with girth at the ground 37 inches, and 5 feet up 27 inches. The *Abies Douglasii* thrives better than any of the other exotics, has a most rapid growth, and matures very quickly. In some years specimens have been found by measurement to have grown 4 feet. *Pinus cembra*, planted at 3 feet 18 years ago, has in several clumps attained a height of from 18 feet to 20 feet. As the summit is reached, a Scots fir of remarkable demensions rises on the left of the path. Fifteen feet of the bole is clean wood, free from branches, and at the ground the circumference of the trunk is 10 feet 5 inches. This thickness is maintained almost to where the large bushy top branches spread away from the stem. In the vicinity are specimens of the *Abies Menziesii* planted from twenty to twenty-two years ago, now thirty to thirty-five feet high, and averaging 2 feet 10 inches around the top of the roots, and 1 foot 11 inches at 5 feet up.

Halting for a moment on the shoulder of the hill, the party gazed in admiration at the extensive panorama spread out before them. To the south-east is Craig-Lourighan, a closely-wooded hill stretching out from the foot of Craig-Gowan. Craig-Lourighan

was planted from 1853 to 1857 with a mixture of larch and Scots fir. The former was raised from home-grown seed and the latter from Tyrolese seed. A careful comparison of the two varieties was made with a view to distinguishing between them, and it was found that no difference existed in the dressed wood : but in the trees as they grew, the Tyrolese variety was more light and airy—the lateral branches being more slender and the twigs more drooping, while the bud is flatter than in the home variety. They grow at about the same rate, and are equally useful ; hence, there appeared to be no reason why one variety should be planted here in preference to the other.

Turning to the right into "Campbell's Walk," a clump of graceful silver alders was seen at the corner. These were planted about six years ago, and, roughly speaking, average 25 feet in height. A knoll just below the walk which leads out on to the main highway by the river side is covered with the *Pinus montana*, and two fine copper beeches skirt the gate at which the party passed out to join the char-a-bancs to drive over Ballochbuie forest. Representative specimens of the *Abies Douglasii* growing on the north side of Craig-Gowan were measured and their dimensions noted. The earliest of these were planted twenty years ago and are now from thirty to thirty-five feet high, a good many of them measuring at the ground from 3 feet to 3 feet 7 inches in circumference and at 5 feet up from 2 feet to 2 feet 8 inches. Considering the high altitude at which they stand, the growth was considered remarkable. It may here be mentioned that in the earlier years of their cultivation the trees seemed to be easily affected by summer frosts but in subsequent years they gave evidence of greater powers of resistance and a more vigorous growth.

The party spent most of the time in exploring the natural forest of Ballochbuie, where, better, perhaps, than in any other district in Britain, the pine (*Pinus sylvestris*), the tree of northern latitudes, is seen in all its pristine glory. Some details of interest regarding Ballochbuie have been kindly supplied, and may be given here. The contour of this ancient natural forest of Scots fir resembles, roughly speaking, two-thirds of a hill-environed theatre. The remaining third opens to the north, and is bounded by the river Dee. The general lie of the ground is, therefore, northerly,

but part of it is east and west. No portion of it has a southern aspect. The soil is generally of a thin moorish nature with a gravelly subsoil a few inches below the surface, both of an open texture, and containing distinct traces of iron. The surface is exceedingly rough and dotted over with large rounded masses of granite overgrown by moss and heather, making the removal of heavy timber difficult. Interspersed there are patches of shallow bog or peat with "pan" underneath. In these strips the pines refuse to grow beyond the height of a few feet, are much twisted and gnarled, and are useless for timber. The forest has not what one so often sees in an artificial plantation—a brown and bare needle-covered floor. On the contrary, the slopes of the hills underneath the trees have a magnificent carpet of blackberry and cranberry bushes, which has a most mellow tinge when the sun, shining through the bluish foliage of the tall pine trees, falls softly upon it. Most of the firs are aged enough to have assumed what may be described as a "bonnet" or umbrella-topped habit, while all have a rough *reddish* bark laid on in plates or scales, like the skin of an alligator—the distinguishing mark of a true native of the Scottish forest. A few are seen assuming a spreading habit of limb and top, but these are exceptions.

Proceeding through the forest by a tortuous path the party came to the falls of the Garrawalt, which, being interpreted, means, "the falls of the rough burn." What was seen of the stream and its surroundings amply justified its name. In the deep gloom and silence of the forest, this brawling, leaping, sparkling rivulet dashes down—the only voice in the solitude,

> "Onward it urges
> Its flood through the gorges,
> And dashes its foam on their
> Pine-covered verges."

The Garrawalt is a veritable child of the mist on the mountain, and when the floods are out, the gentle summer voice (singing so sweetly during the visit) is changed to one of thunder as it madly hurls its brown and swollen waters over the jagged rocks to the

seething and surging pool below. The banks of the stream are beautifully wooded, and from the swing bridge just above the falls a fine view is obtained of the water as it tumbles about the rocks and slides away like a sunbeam over the boulder strewn bed.

The Garrawalt hillock in 1885 was treated experimentally by natural reproduction. Here the surface of the ground had been cleared of heather and cranberry bushes, by means of light hacks or drags, and the rubbish gathered into heaps and burned, so that the seed from the cone fell on naked soil. The ground carried about twenty seed-bearing trees per acre, but they did not often produce a crop of fertile cones. In consequence, fewer seedlings appeared in the first and second years—1885 and 1886—than was expected. To make up the deficiency, in the autumn of 1886 single spadefuls of ground from spots six feet apart were turned up, the men digging through the moorish soil to the gravel. In the following spring a few seeds were dropped on these gravelly patches, and pressed down with the foot. The result was that the young plants appeared thickly, almost every seed germinating. The second season—1886—was unusually productive of fertile cones and the ground originally laid bare produced more than sufficient seedlings to form a close crop, showing that the foregoing treatment is sufficient if due time be allowed for its completion. Still, years must elapse before the superiority of natural sowing can be seen as compared with planting. The natural seedlings are at the present moment considerably behind the artificially planted ones.

Every member of the party was particularly interested in the Memorial Trees planted throughout the reign of our late lamented Sovereign, Queen Victoria, and also since His Gracious Majesty the King came to the throne, to keep in remembrance prominent events, both of a joyous and sorrowful nature. All these are thriving splendidly, although they have not made such rapid growth owing to the climate and the light nature of the soil, as they might have done in more favoured localities. A complete list, the only one in existence so far as known at the present moment, has been compiled by our reporter and is given below.

Though the exact ages of the trees are not given, it may be said generally that all were of small size when planted, say from 1 foot to 2 feet 6 inches. The following are details of Memorial Trees:

Of the *Abies albertiana* species.

(The inscriptions on the metal discs).

Planted by The Queen, October 4th, 1865.
Planted by H.R.H. Princess Louise, October 4th, 1865.
Planted by H.R.H. Princess Beatrice, October 4th, 1865.
Planted by H.R.H. Princess Christian October 6th, 1865.
Planted by H.R.H. Prince Arthur, Duke of Connaught, October 23rd, 1865.

Of the *Picea nobilis* species.

Planted by The Queen on the Anniversary of her Fiftieth Birth-Day, May 24th, 1869.
Planted by The Queen in recollection of Princess Hohenlohe, September 23rd, 1873.
Planted by The Queen in recollection of the Infant Prince Harold, May 26th, 1876.
Planted by H.R.H. Prince Albert Victor of Wales, May 24th, 1877.
Planted by The Queen on her Sixtieth Birth-Day, May 24th, 1879.
Planted by H.R.H. Prince Leopold, Duke of Albany, May 24th, 1881.
Planted by H.R.H. Princess Elizabeth of Hesse, May 24th, 1881.
Planted by H.R.H. Prince George of Wales, May 24th, 1887.
Planted by His Serene Highness Prince Francis Joseph of Battenberg, October 10th, 1896.

Of the *Abies Douglassi* species.

Planted by H.R.H. Princess Victoria of Hesse, May 24th, 1881.

Of the *Cupressus Lawsoniana* species.

Planted by The Queen on the Fortieth anniversary of her accession, June 20th, 1877.

Of the *Pinus cembra* variety.

Planted by The Queen June 13th, for the Jubilee day, June 21st, 1887.

Planted by His Imperial Highness the Crown Prince of Germany, August 27th, 1887.

Planted by H.G.D.H. Princess Alix of Hesse, September 25th, 1888.

Planted on the Seventieth Birth-Day of The Queen, May 24th, 1889.

Planted by Princess Victoria of Prussia, June 17th, 1889.

Planted by H.G.D.H. Princess Leiningen, June 17th, 1889.

Planted by Countess Erbach Schönberg, June 20th, 1895.

Planted by Count Arthur Mensdorff-Pouilly, September 4th, 1895.

Planted by Her Imperial Majesty, the Empress Alexandra of Russia, October 3rd, 1896.

Planted by His Imperial Majesty the Emperor Nicholas II. of Russia, October 3rd, 1896.

Planted by Queen Victoria, June 15th, 1897, in remembrance of her Diamond Jubilee, June 20th, 1897.

Planted by Her Royal Highness, the Princess Christian, June 15th, 1897.

Planted by Her Royal Highness the Grand Duchess of Hesse, June 8th, 1899.

Planted by Her Grand Ducal Highness Princess Elizabeth of Hesse, June 8th, 1899.

Planted by Her Royal Highness Princess Clementine of Belgium, June 19th, 1899.

Planted by H.R.H. Prince Edward of York, June 14th, 1900.

Planted by H.R.H. Prince Albert of York, June 14th, 1900.

Planted in memory of Prince Christian Victor of Schleswig-Holstein, who died while on active service at Pretoria, October 20th, 1900.

A *Fagus sylvatica.*

Planted in commemoration of the Marriage of H.R.H. Prince Henry of Prussia with H.G.D.H. Princess Irene of Hesse, June 24th, 1888.

Of the *Morus nigra* variety.

Planted by H.R.H. Princess Louise of Schleswig-Holstein, June 19th, 1888.

Planted by H.R.H. Princess Victoria of Schleswig-Holstein, June 19th, 1888.

A *Taxus Baccata.*

Planted on the Eightieth Birthday of Her Majesty Queen Victoria, May 24th, 1899.

The Luncheon.

Owing to the large number of members present, two hotels had to be requisitioned for luncheon, and the party divided for the Fife Arms and Invercauld Arms, at Braemar. At the former, after lunch, Mr. Marshall, the acting chairman of the meeting, proposed the health of His Most Gracious Majesty the King, and in doing so, said he was sure they had all been delighted with the beautiful part of the country they had just passed through, which was associated with the name of the King and other members of the Royal Family. (Cheers).

The toast was most loyally pledged.

The Chairman then gave "The health of Mr. Michie," who had been at considerable trouble to arrange for one of the most enjoyable days they had had in the history of the Society. (Cheers.)

The sentiment was enthusiastically received, and Mr. Michie, in responding, thanked the company for drinking his health so cordially. It had been a great pleasure to him to be with them that day, when there had been, he might say, a mixing of the oak with the pine. (Cheers.) He did not think he had done anything to merit their drinking his health. He hoped on some future occasion they might meet again. (Cheers.)

The party returned by the train arriving in Aberdeen at 7-30 p.m.

EXCURSION TO HADDO HOUSE.

The fourth and final day of the Aberdeen meeting was spent on the Haddo House estate belonging to the Earl of Aberdeen. The full complement of members present took the special train provided by the Great North of Scotland Railway Company, which shortly after eight o'clock in the morning left the Joint Station, Aberdeen, and arrived at Oldmeldrum about nine. The eight miles from Oldmeldrum to Haddo House were, as on the former trips, driven over in char-a-bancs. Four of these and an open carriage were ready waiting for the company, and soon everyone was seated. Dashing through the village in great style, with many of the inhabitants out-of-doors to witness the passing of the men from "sooth the border," the party soon reached the open country. And a very open country it was, the arboriculturists thought, after the forests of Durris and Balmoral on the previous day's journeys.

The weather was rather cold to begin with, but mercifully enough, the threatening grey clouds of the early morning cleared away, and the final day's proceedings were carried out, as all the others had been, under comparatively fine and dry atmospheric conditions. The great expanses of cultivated land, with only here and there some clumps of trees, did not impress the Englishmen to any great extent, but after driving a few miles out, some recompense was made for any lack of interest on that score when the famous herds of cattle on the Collynie and Uppermill acres came into view. The "cavalcade" was met on the high-road by Mr. C. G. Smith, factor on the Haddo House estates, who had driven over from Haddo House to welcome the visitors.

At this stage Mr. Smith, as he took his seat in the leading carriage along with the official heads of the Society, pointed out "The Quakers' Cemetery," a little God's Acre in a clump of trees about a hundred yards to the right of the main road. It belongs to and is a last resting-place for Quakers, and as Mr. Smith remarked, not even Lord Aberdeen, on whose estate it lies, can in any way interfere with it.

In a short time the farm lands of Mr. William Duthie, Collynie were reached. Here the party "disembarked," and, leaving the

vehicles to the care of the coachmen and the ladies, began a walk of about a mile over the fields running by the roadside in which the shorthorns of Mr. Duthie were seen. The older cows were first inspected, and a large number of the members of the Society being well-known and noted English agriculturists, as well as arboriculturists, marvelled greatly at the high standard of excellence displayed in the breeding of the massive animals shown. The fine top lines, good under lines, and well sprung ribs of the aged dams were highly prized. Going on to the parks, in which the sires of the famous 700 guineas yearling bulls were kept, another halt was called, and it was with difficulty that the secretary, Mr. Davidson, could tear his party away from admiring them. Most of the members carried a camera, and innumerable photographs of the bulls were obtained.

The herd further on, belonging to the representatives of the late Mr. W. S. Marr, Uppermill, was next visited, and owing to the time spent in this way a short cut had to be made in the drive, which was thereafter completed, to the Haddo House policies.

The company drove to Keithfield Lodge, the west entrance to the Policies of Haddo House. Within the gate and on both sides of the walk is a vigorous growing plantation of mixed hardwoods, about 30 years of age, with an average height of 40 feet; also a number of good specimens of conifers, viz., *Abies canadensis*, *A. nobilis*, *A. nordmanniana*, *A. grandis*, *A. nigra*, *A. Menziesii*, and *A. cephalonica*, and a few good specimens of *Abietia Douglasii*. About 200 yards from the lodge on the south side of the walk is the beautiful Keithfield Lake, and beyond the lake is a "brae" of hardwoods with a crest of fir and larch, being now only a remnant of a valuable wood that was blown down in 1894. Near the Home Farm is the pinetum, where there are a few good specimens of *Abies nobilis*, *A. orientalis*, *A. balsamea*, *Abietia Douglasii*, and *Sequoia Wellingtonia*. After passing the Home Farm we drove through the Morganhill wood—pure Scots fir about 75 years of age, many of the trees containing from 18 to 25 cubic feet, with fine, straight stems.

The first halt was made near the "Old Nursery," where we were shown two fine specimens of the purple beech growing within four feet of each other and over 60 feet high, with clean straight stems for 25 feet, and 45 inches in circumference five feet

from the ground. The company then visited the gardens and the Woodside Kennels. On the east side of the terrace in front of Haddo House are two good specimens of *Sequoia Wellingtonia*—one planted by the late Queen Victoria and the other by Prince Albert on the occasion of their visit to Haddo House in the year 1857—which are now over 70 feet in height. Also a specimen of *A. nobilis* planted by Mr. Gladstone in 1884.

There are many good specimens of hardwoods within the grounds of Haddo House, chiefly ash, beech, elm, plane, oak, chestnut, and maple, as single trees and in clumps. Some of the visitors were surprised to see the lime trees doing so well and growing to such large size. The Deer Park contains a few specimens of fine old Scots fir 130 years of age, being the remains of a fine old fir forest.

One of the most interesting and best appreciated parts of the day's programme was the visit to Haddo House itself. The machines were left behind, and passing along the walks on foot the party arrived at the north entrance to the building. Haddo House, as the inscription on the north wall testifies, was built in 1732 in the style of architecture known as Palladian.

Headed by Mr. John Clark, the chief forester on the estate, the party were shown along the various corridors hung with the invaluable collection of all manner of curios of peace and war, the hunting field, and of antiquity. The chapel, built about twenty years ago by Lord Aberdeen, was first seen, and with feelings of reverence still upon him the visitor passed on to view the library and state rooms of the house. The Countess of Aberdeen's beautiful collection of hand-painted china presented to her by the women of Canada, the pictures by old masters and more modern painters, magnificent furniture and appointments, were seen and admired. Here and there connoisseurs in art works stood as if rooted to the spot, in silent and sublime ignorance of their whereabouts, until wakened from their reveries. Leaving the house by the front terraced entrance, the lovely gardens, well described as being a triumph of landscape gardening, were viewed. The two Wellingtonias, the memorials of the visit of the Queen and the Prince Consort to Haddo House in 1857, were considered most noble specimens of their species, lending interest and charm to the terrace. The Picea Nobilis pine, planted by Mr. Gladstone

on the occasion of his visit in 1884, was considered by the arboriculturists to be an exceedingly healthy specimen. The gardens were then visited under the direction of Mr. John Forrest, the gardener, and subsequently the party lunched in a large covered court. Mr. Smith and Mr. Clark and Mr. Forrest were amongst the guests.

After lunch, the Chairman gave the loyal toasts, and then called upon Colonel Beadon to propose the next toast.

Colonel Beadon, who was received with great cheering, gave "The health of Lord and Lady Aberdeen." The English Arboricultural Society could not do more than give them their heartiest thanks for allowing them the great privilege of going over their great domain and their magnificent residence. (Loud cheers). When the members of that Society saw the great fields and woods managed so well as they were they could not but feel that everybody on the estate was promoting the good of their fellow-creatures and of the property. (Cheers). And naturally they thought they could not be doing wrong if they did not leave out Mr. Smith's name in this toast—the gentleman who was there to do right between man and man. (Cheers). They thanked him for the hearty good-will with which he had shown them over the grounds and he understood there was a good deal even yet to be seen. (Cheers).

The toast was enthusiastically pledged.

Mr. Smith, in reply, said he regretted very much that Lord and Lady Aberdeen were not at home to receive them. He had had a letter from his lordship regretting his own and Lady Aberdeen's absence, and telling him to give them as hearty a welcome as possible. (Cheers). Immediately after lunch they were to drive to the Braes o' Gight. He wondered how many people there could say that word. (Great laughter). It was only a little bit of a glen in a natural state—not, perhaps, spick and span as some would expect—but Lord Aberdeen liked to have it in a natural condition, and as a tree fell so it was allowed to lie. (Cheers). They were also going to see round the woods which the storms of 1893 and 1894 destroyed so much. He spoke without

exaggeration when he said that 160,000 trees were blown down by the gale. He thanked them for the way they received the toast. (Cheers).

After lunch they started for the Braes of Gight, but before leaving the grounds they visited the home nursery, and found it well-stocked with Scots fir, spruce, larch, beech, ash, elm, oak, maple, plane, and other varieties of trees and shrubs. The plants were all in good health, and one expert remarked that one break of 30,000 one year one year seedlings larch was the best he had seen. Leaving the policies by the north lodge the party drove through Methlick to the Braes of Gight, and many of them were astonished to see hundreds of acres along the banks of the Ythan, which had been entirely blown down by the gales of 1893 and 1894. The Braes of Gight are covered on the north side of the river with hard woods, with a belt of old Scots fir skirting the high ground. The trees in many parts are about 120 years of age, and are planted in groups consisting of ash, oak, elm, beech, and gean. The upper parts of the Braes are covered with coppices of hazel, bird cherry, oak, birch, aspen, poplar, and alder. The south side of the river in the valley has a cover of spruce, 90 to 100 feet high, and the braes with larch and Scots fir, but the high ground has been blown down by the gales. The company were much delighted with what they saw in the beautiful Braes of Gight and also with the old castle. The visitors then drove by the Auchedly bridge road to Ellon, and, joining their special train, arrived in Aberdeen at 5 o'clock.

Most of the arboriculturists left later in the evening, but a large number stayed over-night at the headquarters of the meeting, the Palace Hotel.

The meeting, thanks to the indefatigable efforts of Mr. Davidson, the secretary, was considered by all who took part in it —and the attendance was amongst the largest ever seen—to be one of the most successful ever held in the twenty-three years of the Society's existence.

I.—HEDGES, PREPARATION OF THE GROUND, MODE OF PLANTING AND THEIR PROPER TREATMENT, AND DITCHES ALONGSIDE.

By Thomas Conway, Oaktree Cottage, High Legh, Knutsford.

A great many casual visitors to a rural district probably make the tacit assumption that the hedger and ditcher has not much demand upon his skill compared with other workmen in the district. Closer observation may, however, convince such people to the contrary. Though the old system is being gradually altered through the many changes that are taking place in the customs of the country, there are none which play such a striking part as the improvement in the laying out and planting of hedges. The old system of banking and ditching is gradually changing place with the present one, which was introduced with the advent of railways in this country, and really good men at hedging and ditching are very scarce.

Permanent fences of fields are constructed with two materials—"live" and "dead," though for the purposes of this essay, and to agree with the heading, live fences will only be dealt with. They are made of various plants—thorns, beech, hornbeam, holly, privet, and myrtle. Of all the foregoing the one that is in general use and most serviceable is the hawthorn *(cratægus oxyacantha)* or sharp-thorned *cratægus*. Loudon enumerates upwards of thirty varieties, varying in the general form, mode of growth, colour of the flowers, time of flowering, colour of the fruit, form and colour of the leaves. The ancients were acquainted with the hawthorn as a fence; the Greeks called it *pyracantha* or fire thorn. Of all the varieties the one to be preferred is that with the colour of the

young wood dark purple, the new shoots also dark purple with minute white specks, and of the old wood dark orange purple; bark smooth and shiny, leaves dark green and shiny on the upper surface; spines dark purple of medium length, fine and sharp, the stems close together in parallel rods, stiff and straight; flowers rather large, and haws dark red. All the other plants used are generally intended for some special purpose and not for the same protection against stock as the common thorn.

Preparation of the Ground.

Cleanliness in the ground, is the secret of a good hedge, and it is very important that the land should be thoroughly prepared before the hedge is planted. If the thorns are planted on unprepared ground, they will be choked with weeds the first year and continue to be so ever after.

The ground along which the line of fence is to be planted should be surveyed before the commencement of the work, and any necessary draining, levelling, or filling in any slack places done.

Where possible the main fences should run north and south, east and west, and to enable the hedger to do this he should learn to use his watch as a compass, but should there be no sun, he must then use the ordinary instruments—this in case his land-marks have been removed.

The line having been decided upon, the land should be trenched and well manured in the winter. Many "hedgers" plant two or three drills of potatoes; by this means the weeds are kept down, and the land left in a clean state in the autumn, ready for planting. In other places the land is summer fallowed,—that is, ploughed, harrowed, and manured in the summer.

Where thorns are planted in connection with grassy turf, weeds get up at once to the detriment of the young hedge; hence the advantage of bare fallowing or cropping the land which is to grow the fence.

If the line of fence is straight—which it should be, if natural obstacles do not interfere to prevent it—the work of planting can be commenced; should a curve be necessary and geometrical rules cannot be applied, taste is required by the planter; it can

only be formed by setting up large pines in a curve and judging of its beauty by the eye, so that the sweep shall naturally accommodate itself to the irregularities of the ground. Curves in fields should be made conformable to the ploughing of the land, for, if this adaptation be not adhered to, land may be lost to tillage in the acuteness of the curves.

Thorns grow fastest in a deep sandy loam, resting on a porous subsoil, and slowest in thin clay on a tilly subsoil.

Trenching the ground four feet wide will cost per 100 yards, 12s. 6d., or equal to 1½d. per running yard. As a matter of economy the cheapest way of preparing the land is by "trench-ploughing" and then sub-soiling; this can be done at a cost of £1 10s. 0d. per statute acre.

Mode of Planting.

Thorns should never be planted in a hedge till they have been transplanted at least two years from the seed bed, when they will have acquired a girth of stem at the root of about an inch, and a length of three feet including the root.

As thorns are always transplanted too thick in the nursery lines to save room and to draw them up sooner to tall plants, it is advisable to purchase them from the nursery at least a year before they are planted in the hedge, and have them planted in the home nursery in garden mould or deep dry soil. By this process, the stems acquire a cleaner bark and greater strength, and the roots are furnished with a large number of fine fibres, which will greatly promote the growth of the young hedge, and repay the additional trouble bestowed on the plants. When plants are not to be so treated, and arrive from the nurserymen ready for planting, they should be immediately loosened out, and the roots covered with soil, to protect them from frost and to keep them fresh until planted.

The secret of success in planting lies in each man knowing and keeping to his own particular part of the operation. In commencing, let the hedger, with an assistant, take the line and run it along the intended site of the quicks, place a heavy stone here and there to prevent the line from getting out of the straight, or, if stones are not available, small pegs. While the line is being

adjusted, the thorns may be brought to convenient places ready for the planter. The first assistant makes the first cut, throwing the soil to his left; the second assistant follows, clearing the rut; the third assistant now places the plants on the cast-out soil, so as to be within easy reach of the hedger.

As soon as there are a few yards of trench ready, the planting begins by setting up the plants against the perpendicular side of the trench, and then placing some soil on the roots with his hands. This work is carried out by the hedger.

The third assistant now follows the hedger, and puts loose soil on the roots of the plants, trampling the earth firmly towards them with his foot, while with his hand he keeps each plant upright. He then finishes off the remaining soil, and the process is completed. This is repeated until the work is finished.

Where a watercourse occurs in a line of thorn fence, the thorns should be planted as near as possible above the flood mark.

Forest trees should never be planted in the line of thorns, for it is impossible, even with the greatest care, to rear thorn plants to become a good and beautiful fence under their drip. Thorns are impatient of being overshadowed by taller trees; and trees planted in the line of the hedge overshadow and pour their drip directly upon the branches of the thorns.

Doubtless the reason for hedgerow timber was that in the opinion of the people of those times, it was the best way of growing timber for the navy and giving shelter to fields, as on referring to a lease of a farm of 15 statute acres for lives dated 2nd February, 1740, the following clause appears:—

> "Shall and will yearly and every year, during the said term, "plant five young plants of Oak, Ash, Poplar or Elm, in "convenient places in the hedges at convenient distances "from one another upon the said premises, and shall and "will use his and their best endeavours to preserve the "same from destruction, and when and so often as any "of the said plants shall happen to die, be broken, or "destroyed, shall and will make up the deficiency by "re-planting the like number and sorts of young plants "in the room or place of such of them as shall happen "to die, be broken or destroyed."

The lease remained in force until October, 1838. From the foregoing it will be seen that there would be a great quantity of timber produced in this way. Happily now, this farm has no trees in the fences.

The cost of planting will be as follows per 100 yards :—

800 Quicks at 25/- per 1000	-	-	£1 0 0
Planting same - - -			0 4 0
			£1 4 0

or equal to $2\frac{9}{10}$d. per yard.

Treatment of Hedges.

Practically, this section is the all important one of the essay, as on it depends the successful issue of the subject. Custom of country has much to do with it, and explains the different modes of treatment adopted. Foresters differ in their mode of treating a hedge after planting. Some allow the hedge to grow for four years without being touched, and then cut it to its ultimate form ; others allow the young hedge to grow one year, then prune the thorns down to within four inches of the ground. By so doing they encourage several shoots to spring from the bottom, thus making a closer hedge. This method is an excellent one, but is only recommended where there are no rabbits, otherwise the fence ought to be properly protected with netting.

The form best suited for field fences is that of an isosceles triangle or wedge shape, with a sharp apex and two equally inclined faces. This shape makes an excellent fence, as its top recedes from stock. Other forms are adopted, such as the curved faces and rounded head. They look well alongside a public road or near a mansion house, though they are apt to hold a great weight of snow, and thus be damaged. Young hedges suffer more than old ones in this respect. They may be smothered in snow, and on the mass subsiding by consolidation many of the lateral branches may be stripped off and the top shoots broken down. There is no evading this accident, as it would be a very expensive item to send men round to clear all fences.

So far as removal of the injured parts are concerned, the young plants must be pruned in spring with a pruning knife, but no

more. No matter though this necessary pruning leave the young hedge in an unequal state—some of the plants being much crushed whilst others have escaped injury—let it grow; and although the pruned plants cannot overtake the others at once they will do so in time, and the hedge look as if no accident had ever befallen it. Pruning well-grown young hedges consists in only one operation—switching. The first switching is cutting prominent branches from the majority which constitute the body of the hedge and lopping off the leading shoots to a level line of top. This operation is performed with the switching bill, and is used with an upward stroke slanting backwards nearly overhead. Hedgers have a strong predilection for the use of the switching bill. They will, without compunction, switch a young hedge at the end of its first year's existence.

The natural method of allowing thorn plants to grow without pruning is admirably adapted for shelter, and should be adopted in the stormy parts of the land, and as pruning is attended with trouble and expense where hedges thrive, they are allowed to grow up where they cannot do harm, as upon heights and hollows. After having attained its natural height, which may be ten feet, the plants acquire thickness of stem, which will continue to increase for an indefinite number of years. While the plant changes its character the stem increases in thickness, gradually assuming the character of a tree, enlarging its head by the lateral expansion of the upper branches and elevating its stem by a natural pruning of the lower branches, every year rendering itself more unfit for a fence by presenting a row of bare stems. If it is desired to maintain it as a fence, the hedger must restrain its tendency to become a tree. He has this in his power, and may even make an old hedge resume its youthful aspect by well-timed pruning, for such is the accommodating nature of the thorn plant.

Much will depend on the situation of the fence as to the way the hedge will be dealt with, which may be "breasted, plashered and laid," or simply cut down. When it is contemplated to cut down or breast over any hedge, it should not be done at random; it should not be done in the depth of winter, nor when the field is in or coming into grass, but only when going out of grass; still it will scarcely be possible to avoid one field or another, as it rarely happens that

two adjoining fields are under the same sort of crops : the general custom being, when the hedge of one going out of grass is cut down, the cut thorns are furnished on the spot for a dead hedge to fence the other field that is still to be in grass.

As a great many of the existing farm hedges were made on the old bank and ditch system, and will exist for many years to come, they will require the same treatment as the thorns that have been allowed to grow into small trees.

The only sort of pruning suitable for so strong a hedge is cutting it down, and there are two methods of doing this ; one, by lopping the stems and some of the branches at two feet from the ground, the other by cutting off all the branches and stems to within a few inches of the ground. In all cases of cutting the stems of thorn plants, the cut surface slopes upwards to the back of the hedge ; the cuts on the stems are not in the plane of the line of the hedge, but at an angle to it, so that when viewed in the direction in which the hedger is cutting, the cuts are not visible, while from the opposite direction they almost face the spectator.

Hedges are woefully mismanaged in the cutting in many parts of the country, being in the hands of unskilled labourers, who slash and cut them anyhow so long as they get rid of the young top shoots, and the farmer consoles himself with the fact that the hedge cut down will make a sufficient fence when it grows again; but this will not be the case if many of the stems are so far asunder as to leave gaps between them even after the young twigs shall have grown up.

The stems of an "old" hedge are often cut over about three feet high to serve as the fence; the consequence is a thick growth of young twigs where the hedge was cut over, placed a yard above the ground upon bare stakes; in such a state the hedge pruned after this fashion will never constitute an efficient fence without plashering and layering, and in nearly every case will require protection.

Hitherto the pruning and cutting have proceeded on the supposition that the fence when cut will grow again, but this will not be the case if many of the stems are so far asunder as to leave gaps between them, even after the young twigs shall have grown up. In such a state the pruned hedge will never constitute an efficient fence without it is "plashered and layered," which

consists in laying down a strong and healthy stem from one or both sides across a gap. Where the hedger meets with a gap which cannot be filled up by young stems, he leaves a strong supple stem at the gap next him to be plashered.

Hedgers are very sensitive to the criticisms of their fellow-men, and must know what to cut out and what to lay. The hedger chooses out the likely plashers first, twice as many as are wanted, afterwards using what are actually required.

Commencing at the end of the hedge where he began to cut, he prunes off with the bill all the branches from the stem he left, cuts the stem the proper length for the gap, and then makes an upward cut in it near the ground, on the opposite side to the direction the stem is to be plashered, but no deeper than suffices to bend it to the horizontal position, which should be so near to the ground as to fill up the gap from the bottom. The plashered stem is kept down by an offshoot from the stem on the other side of the gap, or by "wattling" it before and behind two or three stems, or by a hooked stick driven into the ground near its point and by a wedge driven into the cut in the plashered stem.

Plashes are laid at all angles and twisted into all shapes, as if to prove that the thorn plant can stand every possible torture.

It is possible, in the oldest hedges, that gaps of such width that they cannot be repaired by plashering and layering may be found, in which case other expedients must be adopted to fill them up, such as laying young shoots from the old stems into the gaps, or filling up the gaps with young thorn plants. The laying cannot be done until the young shoots are pretty long, but young quicks may be planted.

When young quicks are planted amongst old thorns, the old soil must be removed and fresh soil provided by mixing mould, decayed vegetable matter, etc., into a compost, putting the same in the place formerly occupied by the old soil. They should have a good dressing of rotted farm yard manure, and should the weather prove dry, or likely to become so, they should be well watered.

The young plants will sprout rapidly; and to preserve them from annoyance, prune away any straggling twigs from the old stems.

The laying of young twigs is managed much in the same way. The old soil is removed from the gaps and replaced by the compost. A strong twig is brought down from the stem on each

side of the gap, cut short and notched, and held down by a hooked stick, and covered with compost earth. After the layer has taken root, and the young shoot growing with vigour, its connection with the old stem is severed. This plan will fill up a gap no larger than can be filled by one shoot from each side of it.

The attention which hedges require in summer is confined to weeding, the operation being a very important one, not only as regards themselves, but also the condition of the field near them.

This department is much neglected. The hedger himself can do little to the weeding of an extensive range of fences; and he is often called away in summer to many other sorts of work which have no relation to his occupation, and it is only at intervals that the other hands can be spared from their usual avocations to help with the weeding.

A good suggestion, where there is a range of fences, is to employ old men who are unable to undertake ordinary labour to weed the hedges by the piece; if they are diligent, they can get through a great amount of work during a summer.

The best method of keeping the bottom of a thorn hedge clean is by timely weeding — once early in the summer and again in mid-winter, which will preserve the hedges clean all the year round, and at less expense than one heavy weeding at the end of the summer, by which time many of the plants will have shed their seeds and strengthened their roots.

The weeds which infest hedges are numerous. Many of them are common to hedges, corn, and pasture, while others are confined to hedges, such as sticking grass *(galium aparine)*, great bindweed *(convolvulus sepium)*, ground ivy *(glechoma hedreacea)*, woody nightshade *(solanum dulcamara)*, etc., etc. Numerously as these crowd together to take shelter in hedges, there are other intruders which insert themselves between the thorn plants and acquiring strength from the protection afforded them, at length overcome their protectors. Of these the most destructive to hedge plants are the crab apple *(pyrus malus)*, which easily makes room for itself with its stiff, elbowing branches; the sloe *(prunos spinosa)*, common dog rose *(rosa canina)*, and even the favourite sweet briar *(rosa rubiginosa)*, placed in a hedge for the sake of its odour; the common blackberry or bramble *(rubus fruticosus)*, and the common barberry *(berberris vulgaris)*.

With young fences there will be the cost of protection fences, which will be as follows, per 100 yards :—

51 creosoted posts, 5ft. 6in, × 6in. × 3in., at 10d. each - - - -	£2	2	6
2 creosoted straining posts, at 1s. 6d. -	0	3	0
5 wires, say 1½ cwt., at 12s. per cwt. -	0	18	0
Labour, at 2d. per yard - - -	0	16	8
260 staples - - - -	0	3	0
Total cost per 100 yards - -	£4	3	2

Or equal to, say, 10d. per yard.

The wires will be placed 5, 7, 7, 8, and 9 inches apart, and plain galvanized iron wire, No. 5, will be used. Adding the cost of thorns and planting, the total cost of fencing will amount to 14⅓d. per lineal yard.

Ditches Alongside Fences.

Immediately connected with the treatment of hedges is the management of the ditches, and the repairing of hedge banks.

A ditch which conveys a constant stream of water, may have so much mud deposited in it as to require scouring, before the space about the roots of the hedge is able to accommodate all the matter that should be scoured out of it. In this case, as much mud should be placed between the hedge roots as can conveniently lie, which will serve the double purpose of easily getting rid of part of the mud, and of doing good to the hedge by thickening the soil around its roots, and the remainder should be placed on the ditch lip to be removed at leisure for other places; but the more usual and better practice is, when the ditch is to be scoured, to repair the hedge back, and prune and trim the hedge and clear away all surplus mud.

The propriety of combining these works is obvious from these considerations; after weeding hedges for some years, and the incessant action of the atmosphere, the earth is much removed from its original position. The effects of these combined causes are to leave the roots of the hedges too bare; and if the deficiency is not made up, the hedge will be shaken to the roots by every wind that blows. In case the amount of soil required is

more than the scourings of the ditch, the face of the hedge back should be faced with sods from the side of the ditch, which should be nine inches broad and four inches thick, and the length of the spade. These sods are laid with the spade on their edge upon the bottom of the back, with the grass side outwards, beaten into the bank, and their upper edges pared and made straight.

The reason for putting the grass side of the sods outwards is, that the sods may adhere, and grow to the bank; for if they were put on with the grass side inwards the frost of the ensuing winter would cause them to slide down. After this layer of sods has been laid, another layer can follow, and care being taken that they break joint, the top layer should be placed face downwards upon the upper edge of the last row, beating them flush with the face of the hedge back. The reason for placing the grass side of the last row face downwards is to prevent grass growing among the roots of the thorns; they are kept in their places in winter by the sods below, and by having no weight to carry.

One of the great causes of ditches silting up is the growth of weeds in them, both in the bottom and on the sides. These cause the bottoms to silt up and the sides to break down. Among them will be found the beautiful yellow corn flag *(iris psendacoris)*, which takes up its station on the sides of ditches and directs the water to the opposite side: the water cress *(nasturtium officinale)* grows in the bottom of the ditches and arrests mud in its progress down the stream, but will only grow to any extent where spring water flows; the common butter burr *(petasites vulgaris)*, with large expanded leaves occupying a prominent position on the ditch side: the red canary grass *(phalaris arundinacea)*, which with its creeping roots tufting here and there proves troublesome in unduly hardening the parts of the sides of the ditch where it grows; the floating meadow grass *(poa fluitans)* floats its long narrow leaves down the stream of water in the ditch, retarding and strengthening it; while the brook lime *(veronica becca bunga)* is found in the direct water-course. The only mode of destroying weeds in ditches is to scour the bottom and pare the edges with the common spade, extracting the roots of the obnoxious plants growing in both.

II.—THE FORMATION FOR ECONOMIC PURPOSES AND TREATMENT, FROM PLANTING UP TO MATURITY, OF A CROP OF LARCH.

By R. J. Wylam, Lambton Park, Durham.

Many are of opinion that no tree cultivated in Britain is more worthy of attention than the larch. There are few purposes for which oak is now used that larch would not answer as well. It is a rapidly growing tree, and attains maturity long before the oak. Larch trees, little more than 30 years old, have been known to be sold for 60s. each, while oaks of the same age, and growing upon the same soil in the same neighbourhood, were not worth 10s. each. This at once points the advantage of planting larch where immediate profit is the object in view.

Formation of the Larch and Nursery Culture.

The larch is entirely reproduced from seed. The cones ripen in the autumn, and the seed is shed during the ensuing spring. It is therefore preferable to gather them during the winter, say in December or January. It is found that when gathered at this season the scales open more readily with heat than when they are harvested in November. By way of preparation the cones should be placed in a kiln made for that purpose. They may be laid from six to eight inches deep, and the heat of the kiln raised to about 100 degrees Fahr. On no account should the heat of the kiln be more than 105 degrees Fahr. They should be turned once every two hours during the time they are being warmed. At the end of twelve hours the cones should be removed, in the warm state, and laid some eight or ten inches deep on

a stone or hard floor, on which they should be threshed to pieces with flails, care been taken to sift out the seeds by means of a riddle from time to time until the whole of the seed has been extracted.

Nursery Culture of the Larch.

In sowing the seeds of the larch or any other coniferous tree special care should be taken only to do this in dry weather; it is necessary to have all the ground prepared very fine and light through digging and repeated raking; the rake should act freely without the soil adhering to it. The ground then should be marked off into parallel beds of four feet in breadth, every two adjacent beds having a path one foot broad between them. The seed should be sown at an average of about two seeds to the square inch. When sown it should be covered over with about a quarter of an inch of very fine soil. The plants should be allowed to remain only one year in the seed beds, at which stage they are called one-year-old seedlings. They should then be schooled by being transplanted into nursery-rows. Remaining in the rows for one year they are termed one-year-old transplants; if they stand for two years they become two-year-old transplants, and so on. In forming plantations on high lying parts of the country, the larch may be put out either as yearly seedlings or as two-year-old schooled transplants that have stood for one year in the nursery lines. But if the transplants should be wanted to be about 9 ins. in height before being planted out, they would require to stand for two years in the nursery rows, and should afterwards be planted where they are finally to remain. The season for transplanting is early in spring, because the larch vegetates earlier than most other trees and suffers more than most other trees when removed after it has begun to grow.

Plantation, Culture, and Subsequent Treatment of the Larch.

It is most essential when rearing larch for profit that the following natural laws and artificial assistants should be understood and carried out as far as possible, namely :—

1.—Soil and situation proper for healthy larch.

2.—Fencing the plantation to prevent the inroads of cattle and vermin.

3.—Proper method of drainage.

4.—Planting out of the young trees intended to form the crop.

5.—System of thinning and rearing a larch plantation (for timber only).

I.—Soil and Situation Proper for Healthy Larch.

In planting a large piece of land exclusively with larch, the planter should be careful first to ascertain that it is in every respect adapted to grow the tree to valuable size, as no tree we cultivate is so easily injured in health when planted on an unsuitable soil. The larch will grow rapidly upon almost any soil and in any situation for the first 20 or 30 years, but it is only in a clear, dry atmosphere, on a cold-bottomed soil, somewhat moist on the surface, that its timber is brought to perfection. In plains and near the sea it grows rapidly for 30 or 40 years, but when felled in such situation the wood is often found rotten at the heart, and unfit for any purpose except fuel. From this tendency of the tree the greater number of planters at the present day seem more disposed to use it as a nurse to hardwoods or as an admixture with the pine and fir than as a tree to be planted exclusively as a crop. This is a mistake, however, in the forestry of the time, as can easily be proved from the excellent crops of larch found growing in a sound and healthy state, in all varieties of soils and situations, wherever the condition of the land is either naturally or has been rendered artificially suited to it. This condition consists simply and mainly in the land being of a deep, open, and porous description, and the particles of which the soil is composed being kept in a clean and wholesome state by the ready passage of rain water through it. Larches generally thrive better on the declivities of mountains because of the little dampness there always is in the earth descending from above, and at the same time the trees, on account of the inequality of their bases, have more spare space at their tops and are better exposed to the light. There are, indeed,

few soils on which the larch may not be grown satisfactorily, provided that their thorough drainage is attended to previous to planting. The great mistake in regard to the cultivation of the larch in this country has been the planting of it on lands in which all lodged ingredients prejudicial to the healthy growth of the tree had not been cleansed away by the action of drainage. This is a fact not now to be doubted, as on all soils that have been properly opened up, made porous, and cleansed by drainage larch is found to succeed satisfactorily, even although on the same soils it failed to grow previous to drainage.

II.—Fencing the Plantation to Prevent the Inroads of Cattle and Vermin.

It is absolutely necessary that every piece of land laid out for a plantation should be fenced in some way or other previous to its being planted. Many different methods of fencing have been adopted for the enclosing of young plantations, and for me to give a description of the different kinds erected now-a-days would entail an essay in itself. In the matter of fencing, as well as in that of shipbuilding this may truly be said to be the "iron age," for wire fences are now, generally speaking, setting aside and taking the place of most others. As wire fences then, are of the first importance in this branch of our subject, it may suffice to describe the different classes of them briefly. There are three different classes of wire fences in general use, namely, those consisting of wire strained on wooden posts; those erected on iron straining posts with wooden intermediate ones; and those erected entirely with iron and without wood. Space forbids me to describe the mode of erecting each of these classes, yet there is little difference in principle as regards the method of erecting them. Wire fences consisting chiefly of four parts—namely, the straining pillars, the standards or intermediates, the stays and the wires. The straining-pillars are for keeping the horizontal wires at full stretch, and may be of wood, or of cast or wrought iron, batted into large stones, wooden or cast iron blocks, sunk and firmly fixed in the ground and supported by stays. If the line of fence is straight, the pillars are placed from 80 to 100 yards apart; but if the line is curved, intermediate ones with stays are required.

The standards may be of wood or wrought iron, and are placed from five to seven feet apart according to circumstances. They are absolutely necessary to keep the horizontal wires at regular distances apart, and to support the fence as a whole. Wooden standards are driven into the ground in the same way as the posts are in a paling fence: but iron ones require to be either batted into stones or driven into sunk blocks of wood, or they may be fitted with prongs at bottom to admit of their being driven into the ground. Stays are necessary for the standards at all curves, but these are made much slighter than for straining-pillars. Stays may be of wood or wrought iron, and are required to prevent the straining-pillars from being drawn off the perpendicular by the tension put upon the wires. Iron stays are made double for straining-pillars, and single for standards, and are batted into stones or driven into wooden blocks, or they may have flat blocks attached. The wires are placed parallel, and at suitable distances from each other. They are passed through holes bored in the iron standards, or are fixed with staples to the wooden ones, and are kept at a proper tension by the straining-pillars. There are various sizes of wire used in fencing, but the principal are those known as Nos. 4, 5, 6, 7, and 8.

In all cases the distance between the wires at bottom should be less than that at top. In general, where there are sheep and lambs, the distance of the two lower wires should be five inches, widening gradually to ten inches between the two upper ones. Fences of this description can be made of any convenient height. For deer, they are generally made six feet high; these having ten wires in depth instead of six as generally allowed for sheep and cattle. The higher the fence the deeper also ought the posts to be sunk into the ground. Iron straining pillars are a great improvement in wire fencing, not only because they are more permanent than wooden strainers, but also because the fence can be more easily and more neatly put up with them than with the other—especially with the use of those fitted with the winding apparatus. It will be necessary to use wire-netting to protect the plantation of young trees from rabbits and hares. When netting is erected, care should be taken that it is not only erected properly, but that netting of the correct mesh and width should be used. Not less than four feet in width, or more than one and quarter inch in mesh,

let well into the ground, and leaning well towards the outside, will exclude nine-tenths of rabbits, and that is usually as much as one ought to expect.

III.—Proper Method of Drainage.

Assuming the plantation to have been properly fenced, the next important step will be the preparing of the soil by drainage. As it has previously been mentioned that the larch will grow well in all varieties of soils and situations, provided that the land has been rendered suitable by drainage, it may not be out of place here to give a general specification for drainage suitable for a healthy crop of larch, which may be set down as under, viz. :—

On light, open-bottomed lands, the drains should be made in the form of open cuts 3 feet deep, and from 55 to 60 feet apart.

On lands of a medium character in respect to their openness, and retentiveness in the sub-soil, the drains should be made 3 feet 6 ins. deep, and from 40 to 45 feet apart.

While on lands of a stiff and retentive character the drains should be made 4 feet deep and about 30 feet apart.

The distance apart at which drains should be put on the ground depends entirely upon the nature of the soil to be operated upon. In any cases, drains should never be cut closer than 30 feet, nor wider than 60. As each drain is opened and completed, the earth and turf taken out of it should be broken and spread in a regular way over the ground between it and the next drain, in order to improve and deepen the land all over; and on no account should the stuff be left in ridges along the margins of the drains, as is too frequently done, causing it ere long to tumble down into cuts, where it obstructs the free passage of water in them, and so injures their desired end.

IV.—Planting out of the Young Trees Intended to Form the Crop.

The area intended for the larch plantation having been well fenced and drained, and allowed to remain under the action of the drains for one, two, or three years, according as it is naturally

open or otherwise in the sub-soil, it should next be planted with that tree, say at 4 feet apart. In raising larch timber as a profitable crop upon any landed property, two things require to be kept in view, namely—1st, to ascertain what size and quality of trees will come to be of highest marketable value in the district; and 2nd, to have a system of thinning which will keep the plantation in a healthy condition, and at the same time relieve the ground of all inferior encumberers. The distance at which the young trees are planted apart will, therefore, depend entirely upon the requirements of the district. In illustration of this, we may suppose the district to be a hop-growing one, then it would be wisdom to plant the larch solely with a view to these requirements Being clean of stem and of a durable nature, it is much sought after for hop-poles. There are two different modes of growing the larch for this purpose, which will be described under a separate head. In the planting of the young trees, the method of planting in pits should be employed if two years transplanted larch is used. These pits are made with the common spade, at various distances—of from $3\frac{1}{2}$ feet upwards, as the case may be; that is if the whole of the plantation intended to be done is to be planted with two years transplanted larch, then the whole ground will require to be pitted to the distance required. Of course, the making of pits entails more expense than the notching method, but when transplanted stuff is used it is imperative. For, if the roots of a two years transplanted conifer or young hardwood tree are put into the ground merely by a simple opening with the spade, they are so soft and tender that they are unable to push their way through the solid earth in search of food; the natural consequence is, that if the tree does not altogether die, it grows weakly, and is long in attaining the character of a healthy tree. It is, however, only necessary to plant in pits those trees which are of pretty large size, such as hardwood, larch, firs and pines, two years transplanted and upwards; trees under that age and size having smaller roots, only require to be planted in the natural surface soil, which is generally free and open to the roots of all small plants. The method of planting, termed notching or slitting, is done with the common spade or planting mattock, and is so well understood by all planters that it would be superfluous to enlarge upon it here.

It is the practice most commonly in use for the planting of all small trees, such as two years' seedlings, or one year's transplanted pine or larch.

The system of notching in trees by the planting mattock is done upon the same principle as that by the spade, and is generally practiced upon a thin hard surface where the spade could not be used conveniently.

V.—System of Thinning and Rearing a Larch Plantation (for Timber alone).

When the plantation of larch has attained from 10 to 15 years' growth, it will probably be so far advanced as to stand in need of thinning for the first time. In thinning a plantation consisting of larch alone, from the trees being generally of a uniform habit of growth, the work is comparatively easy of performance, and only requires proper attention to remove at each course of the operation such of the more weakly trees as encumber or interfere with the development of the more healthy and promising ones.

The larch being a tree clothed with slender branches and soft delicate leaves, is easily injured by confinement. The trees, therefore, require, at all stages of their growth, to be kept apart from one another in the plantation. If this point is not attended to, and the trees, especially when under 30 years of age, allowed to become crowded, their roots and branches will both become weakly and impaired in their healthy action, and the result will be rot in the heart.

In commencing to thin the plantation, it is necessary to have in view its situation. The operator should observe that if the situation be a high one, he must thin sparingly at first, for fear of checking the growth of the trees.

Due regard should be paid to the quarter from which the most violent and destructive winds blow, and having ascertained their quarter, it is wisdom to thin most carefully on that side and more severely in the interior of the plantation. But if shelter is given naturally by surrounding hills, less care is necessary, and the trees may at once be allowed more freedom in order to develop more quickly and perfectly.

In the thinning of a young plantation of larch, or any of the

fir tribe, for the first time, it may be asked at what distance the trees should be left the one from the other. No certain distance can be specified, for this reason, that the young trees do not all grow alike in the same plantation, either as regards height or breadth of branches, and consequently they do not occupy the same space upon the ground.

In the first thinning of a plantation of any extent it will often be found prudent and necessary to pass over some parts altogether without taking out a single tree. This happens if the ground is of a poor, thin nature: while again, wherever the soil is suitable, and perhaps a little shelter is given, it may be found necessary to take out nearly one-third of the trees in order to give proper air and room. All this must be regulated more by observation than by any given rule.

No pruning of larch or pine should be allowed; pruning invariably lessens the quality of the wood of such trees, and their health also is much injured by it. If the trees are kept, say one-third of the height of the tree itself, they naturally prune themselves as they advance in height, for as soon as the lower branches of the coniferous tribes become confined, and a want of air ensues in the body of the plantation, they gradually die and fall off, without in the least injuring the quality of the timber. All the ends or stumps, however, of dead branches, should be carefully removed from the stems of larch, pine, and fir trees, and that as soon as they become deadened; this tends to make the quality of the wood much finer. In the act of thinning, great care should be taken that no large open space be left among the trees, which in any direction would in length measure more than the height of one of the trees growing by it. This can easily be avoided by proper attention in the disposal of the trees upon the ground, so as not to have them running in rows, but in such an alternate manner, that, which way soever the eye looks from any given point, there may always be a tree to intercept the view within a short distance.

If open spaces be left for any considerable distance, the wind gets play among the trees and has a tendency to cause havoc among them, particularly after being newly thinned, and the more so if the plantation has been formerly neglected; at the age proper for a second thinning, it should never be too severely thinned,

because at such an age—say about 15 or 20 years old—the trees are generally in a very healthy and rapid state of growth, and if they should happen to be checked at such a stage, the ultimate value of the whole plantation might be impaired. Hence it is requisite, in all cases, to thin with experience and caution.

It is always better to thin frequently, and take out a few trees at a time from the plantation, than to thin at distant periods, and then do so severely; after any young plantation has been thinned, it is advantageous to its welfare to go over it and take out a few trees in the way of thinning at intervals of three years. The plantation may be gradually thinned as the trees advance in height and breadth, until they are from 45 to 50 years of age; after such period no such plantation which has been properly managed, should be at all disturbed by thinning, except to take out injured, unhealthy or decaying trees.

The distance of the trees one from another should, as formerly stated, be about one-third of their height, and indeed this ought to be as nearly as practicable the rule for pine and larch plantations at all stages of their growth, commencing our calculation with the time the trees receive their first course of thinning. There is no season of the year so advantageous for the thinning of plantations as the months of March, April, May and June: for, when the operation is performed within these months the crops operated on have the advantage of the summer weather during which to grow freely, and to attain a greater vigour of health before the storms of winter set in upon them; the opposite of this must follow in regard to the trees in a plantation thinned in the autumn.

At about 70 years of age the wood of the larch, or any of the pine and fir tribes is generally considered to be in its most valuable and solid state as timber. It is then heavier and more full of resinous matter than at any other stage of its existence, consequently at that age, if the object be a crop of valuable timber, the trees should be cut down and disposed of as may seem best.

Rearing and Management of a Larch Plantation for a Supply of Hop-Poles.

There is no class of tree crop more simple of cultivation than this, as the only point aimed at is that of obtaining the largest quantity of clean, straight poles, from a given piece of land, as formerly stated.

Two different modes are in practice for the growing of larch for hop-poles. One is to plant the young trees at distances varying from 18 to 30 inches apart, according to the size of poles wanted, and to let them grow undisturbed till they are the size wanted, when they are cut all over and disposed of at once (yearling seedlings, or two-year-old schooled transplants, notch planted, will be found to be the most speedy and cheapest style of planting these crops).

The other mode is to plant the young trees at 18 inches apart, and when they have arrived at a state suitable for the smaller size of poles, to thin out each alternate tree, and leave the others to grow for some years until they are fit for the larger sizes. Either of these modes may be adapted, according to the class of poles that may be found most in demand in the locality.

It is said that in Woolmer Forest and its neighbourhood large quantities of young larch are reared for this purpose; and they are there known to be planted, some fields at 18 inches apart, others at 20 inches, others at 24 inches, others at 30 inches, and others at 3 feet apart, all depending upon the character of poles it is wished to grow, whether of a small size or of a large one. Of course, the smaller the poles are wanted, the closer the trees are planted.

It is often found desirable to rear several crops of this sort in succession on the same piece of land; and where this is an object with the cultivator, it is necessary to trench the land at the outset, as by so doing the young trees will grow more rapidly, and will, therefore, be fit for the market some two or even three years earlier than if they had been planted on uncultivated land; and, of course, from this a great advantage is gained, both in point of time and in the smaller amount of rent to be paid for land occupied by the crop.

In preparing the same piece of land for a second crop of hop-poles, it should be trenched—and all roots taken out in the operation—some 18 inches deep, so as to bring up new land and bury the old surface which has grown the first crop. This done, a green crop should be taken from it after manuring, when it will again be in a state properly fitted to grow a second crop of poles, which, from being planted on manured land, will grow rapidly, and repay any outlay in this respect.

This may be done successfully, one crop after another, for any reasonable length of time, as it is not timber that is wanted, but mere poles from 10 to 20 feet in length.

III.—THE PRODUCTION OF CONIFEROUS TIMBER.

By Mr. Robert Anderson, F.S.I., Cirencester.

The fact that when timber of the first quality is required in Britain, that which is imported is usually preferred to that which is grown at home, especially in the case of coniferous timber, is a serious reflection on the methods of sylviculture that have obtained here for the last century or more. Although we may not be able to produce as fine timber as that which is grown in the most favoured situations elsewhere, there is little doubt that, speaking generally, the quality may be very considerably influenced for the better by the conditions under which the trees are grown.

The quality of timber depends chiefly on its durability and power to resist strains, and the main factor determining these properties is its structure. A cross section of a piece of wood under the microscope shows us a quantity of openings or cells. These are called tracheides, and their appearance may be compared to that of a honeycomb. It will be observed that in each zone representing a year's increase in circumference, there is a greater proportion of large cells with thin walls, which are those formed in the spring, and a less proportion of narrow cells with thick walls, being those that are formed later. These narrow cells with thick walls form the darker coloured dividing line between one year's growth and the next, and the larger the proportion of narrow cells the greater is the durability of the timber.

Now, if a section of foreign red or yellow fir *(Pinus sylvestris)*, such as is used in building, is compared with a similar section of the same variety grown in Britain, it will generally be found that the zone showing the annual increase is of greater breadth in the latter than in the former, and a further examination will show that

the greater width is caused by a greater number of the wider cells composed of spring wood of a porous description. Home-grown coniferous timber is consequently rejected because it contains so large a proportion of soft wood, while that which comes from the Continent is utilized because the narrow annual zones contain a larger proportion of close-grained hard wood. A further reason for preferring imported to home-grown fir is that the former is comparatively free from knots. Since our climate and soil, speaking generally, are favourable for timber production, the explanation of our failure to produce what is required must be that our methods are at fault. The timber that meets the requirements of architects and builders is that produced in forests that have been left to Nature, or those where the management more nearly accords with natural principles. Such timber is not only more durable, but the trees themselves are of a more cylindrical form. In the natural forest a constant struggle goes on, there is a strife for survival, and the weakest trees are suppressed and killed, not until they have played their part in overshading and clearing off the side branches of the stems of the dominant trees, and in sheltering and enriching the soil by their shade, and by the supply of humus afforded by their decaying leaves. By this means height growth is stimulated, and at the same time the shape of the stem will be more perfect owing to the conditions of growth. Other things being equal, the tree that can be converted into scantlings with the least waste is the most valuable, and this result will be attained the more nearly the bole or stem approaches a cylinder in shape. In order to arrive at this, the circumstances that prevail where such trees are found should, as far as possible, be imitated. We know that the finest coniferous wood, having close annual rings, comes as a rule either from countries with cold climates, or where the trees have been standing thickly on the ground until they have nearly attained full height, and is the result of slow, uniform, and prolonged growth. Where these conditions obtain, spring growth is either delayed by the climate, or owing to the restricted area of the crowns exposed to the rays of the sun, and to the shading of the stems and the surface of the soil, is retarded in the lower parts of the stem three weeks or a month after the vital functions have commenced in the small branches. The result in either instance is that the increase of the stem is

greater in the upper part close to the crown than nearer the ground, and the form of the tree is less tapering than if grown in an open situation, while the stem bears a much larger proportion to the branches than would otherwise be the case.

The Hauptsmoor Forest near Bamberg, in Bavaria, containing about 7800 acres, which I have recently visited, under the experienced guidance of Dr. Schlich, is an excellent example of what can be done to raise timber of high quality, on an inferior soil, and with a not very favourable climate. The greater part of the soil is an alluvial sand of poor quality which, however, contains moisture at a depth that can be reached by the roots of the trees. The forest is in the valley of the river Regnitz, and while vegetation starts early, spring frosts are frequent. The natural conditions do not seem favourable to the growth of high-class timber, and yet it is from the Hauptsmoor that the most highly prized Scots pine wood for masts and large spars is obtained. Formerly, when the crop was realised at 120 years' growth, a few of the more promising trees were allowed to stand for large masts through a second rotation, or until they were 240 years' old, and the stems of such trees are said to have measured from 80 to 100 feet in height, with a diameter of 20 inches at the small end. Now that wooden masts have been to a large extent displaced by iron, the production of large trees for this purpose is of less importance, and it is found more profitable to clear cut at 120 years. The trees are, however, of remarkable growth. I myself measured a felled tree in this forest the diameter of which was as follows: At the ground, 17 inches; at 39 feet, 13 inches; and at 60 feet, 10 inches.

On soil of this description it is by no means easy to regenerate the sections that have been cleared. In some cases sowing is practised, when from 10 to 12lbs. of seed is used, and in others as many as 12,000 one-year-old plants are set to the acre. Owing to the attacks of the honey fungus *(Agaricus melleus)*, the leaf-shedding disease *(Hysterium pinastri)*, and the pine weevil *(Hylobius abietis)*, a great deal of planting up has to be done, in spite of the heavy initial stocking, and later on the pine beetle *(Hylurgus piniperda)*, attacks the shoots. The first thinning is not made until the trees are from 30 to 40 years' growth, according to circumstances; and there are generally three or more subse-

quent thinnings, the final clearance taking place at 120 years. At this stage there are about 175 trees per acre, and in a compartment recently felled at the time I visited the Hauptsmoor the final crop had contained 6700 cubic feet per acre, valued at £240. The annual yield of mature timber from the whole forest is 385,000 cubic feet, and as the average quantity of the intermediate thinnings is ascertained to be one half the final crop, the total aggregate is 577,500 cubic feet, equal to a yield of 70 cubic feet per acre per annum over the whole area. Reduced to our British quarter-girth measure this would be about 50 feet, and the net cash receipts amount to over £13,000 a year, or 33s. per acre. That an average of nearly 8d. a foot, after paying all charges on the forest, should be obtainable for Scots pine timber, including small thinnings and branch wood, is striking testimony to the excellent quality of timber produced.

Now that public attention has been attracted to the possibility of afforesting the waste lands of Great Britain and Ireland, the methods pursued in the Hauptsmoor, which, with very indifferent natural advantages, result not only in the production of high-class timber, but also a good financial return, cannot be otherwise than instructive. The soil is very similar to that of thousands of uncultivated acres in Sussex, Hants and Dorset, on which it is impossible to profitably produce any agricultural crops, and which are included in the returns of the Board of Agriculture as waste lands. There seems little reason why, if cultural operations similar to those prevailing in the Hauptsmoor were intelligently carried out, these barren tracts should not be made to contribute to the prosperity of the country by producing some of the timber we now import from the Continent, and, at the same time, afford profitable employment for the working classes.

IV.—THE FORESTRY EXHIBITION AT THE ROYAL SHOW, 1904, AND SOME OF ITS LESSONS.

By North Wind.

During the past few years forestry has received a greater share of attention than hitherto, partly because there is every probability of a shortage of timber in the not very remote future, and partly also through the medium of the two Arboricultural Societies in Scotland and England.

Being inspired with enthusiasm for the advancement of forestry, the Council of the Royal Agricultural Society of England decided to afford facilities for an exhibition at Park Royal. Amongst the many important features which contributed to its success, perhaps the prevailing factors, were the absence of a prize list on the one hand, and the avoidance of demanding a rigid stereotyped set of exhibits on the other. The former generally creates selfish rivalry, while the latter must obviously present a considerable amount of over-lapping; or, again, the negation referred to means mutual co-operation on the part of exhibitors, and the demonstration of general principles from the exhibits themselves.

Section I.—*Cones of Forest Trees.*

In this section Messrs. Jas. Veitch and Sons, Ltd., Royal Exotic Nursery, Chelsea, exhibited a very full collection of cones representing above 200 species of coniferous trees, most of which are cultivated in Great Britain and described in Veitch's *Manual of Coniferæ*. This was certainly a very interesting collection, but was one that would require a considerable amount of time, aided by the "Manual" itself, to either master or fully appreciate.

However, it was nicely got up, and was suggestive to the land owner for variety planting, and to the scientific forester as an arboricultural study.

Section II.—*Seedlings and Transplants.*

(Shown in the open space adjoining the Exhibition.)

His Grace the Duke of Northumberland, K.G., Alnwick Castle, Northumberland, exhibited a mixture of seedling oak with beech, and hornbeam, being an illustration of the French method of growing oaks at the rate of 800 per acre. Of course it is obvious that this plot was only a faint illustration, inasmuch as the French method is "natural regeneration," whereas of course this was artificial. In the French forests Nature reproduces a very large preponderance of beech and hornbeam over oak, but if Nature does not provide 800 oaks to an acre, then the forester plants to make up the natural deficiency. In the French forests as they stand to day we see practically three systems, or rather one system resulting from two previous failures. First, the oaks were planted "pure," but this resulted in failure, as the oaks became "stag-headed" at the top, and the stems covered with what we term epicormic branches and the French "greedy-branches." Next came a system of mixing oak with beech and largely leaving the result to Nature. But when the final cutting came it was found that the beech had either killed or unduly suppressed the oak. —"The nurse had devoured the baby." The present system is that beech is always made subservient to the oak. It is entirely unnecessary to go into details about this method of sylviculture seeing that the E.A.S. has been so recently on the spot. There is no doubt, however, that in this system we have a very valuable object lesson, and perhaps the most practical inference is that we do not plant enough of beech. As a general rule it would be unwise to plant it for timber purposes, but the leaves are richer in manurial value than any other tree we have got, and being a shade bearer it protects the soil against too great evaporation, stimulates increment through the agency of its dead foliage, and keeps down the side branches of oak, ash, elm, or other hard wood trees. It is also possible we might produce better results by mixing beech with Scots fir or larch, for by keeping it well

suppressed, but thickly mixed, we should get more increment and greater branch suppression.

Alongside the exhibit referred to there was one from Lady Wantage, Overstone Park, Northamptonshire, viz. : specimens of oak, ash, beech, larch, Scots pine, Douglas fir, spruce fir, and Corsican pine of from one to five year's growth. The plants on the whole were very good, and the educational feature of this exhibit was valuable as being suggestive of the varying sizes which are applicable for planting in various parts of the country. Thus, on bare ground the small young plant is essential, while in some of the southern parts of England a comparatively large plant to mix amongst the brackens gives the best results. It is therefore necessary to have each class of plants so grown in the nursery lines that the best results may be attained.

The Hon. Mark Rolle, Stevenstone, North Devon, exhibited a most interesting and unique collection of over 150 forest and ornamental seedlings and transplanted fir trees, raised almost entirely from seed grown on the exhibitor's property in Devonshire. The plants themselves were the very picture of health, and the method of exhibiting them was so beautifully done that they were considered the feature of the exhibition. The exhibitor afterwards presented them to the English Arboricultural Society, for which every member tenders grateful thanks, and it is to be hoped that such a large variety will prove a valuable acquisition.

In the same section three very fine collections of forest trees suitable for various classes of planting were exhibited by Messrs. Dicksons, Chester; Little and Ballantyne, Carlisle; and Mr. J. R. Rirssell, Richmond.

Section III.—*Woods and Plantations.*

The Commissioners of His Majesty's Woods and Forests exhibited three frames of Photographs illustrating the system of high forestry in French forests ; and also two frames of Photographs of typical trees and scenery in the New Forest. In those two exhibits we have the contrast as it were of Continental sylviculture and English estate forestry. The latter style produces character in individuality, thus giving us the unique

charm of English landscape : while the former method gives greater yield per acre and therefore more volume for exploitation.

The Royal Agricultural College, Cirencester, exhibited an Ordnance Map showing woods in Oakley Park available for instruction purposes of the college students, and forty photographs illustrating well known continental woods with notes of yield, etc. To some extent we have the same educational features brought out as in the former exhibit. The photographs referred to, together with the scope and variety of the subjects illustrated, prove of great value to students, and remind us that forestry cannot be taught effectually in the lecture room without a field for practice and observation. It is perhaps somewhat difficult to give a definition of English estate forestry, but it may be termed an art based on scientific principles—practical and theoretical. Having regard therefore to this coined definition, the four sets of photographs referred to embrace a very large field indeed.

The Marquis of Bath, Longleat, Warminster, exhibited twelve photographs of specimen trees, and these were of special interest to members of the E.A.S., inasmuch as the Society visited Longleat only last year and spent a most enjoyable and profitable day there.

The Earl of Yarborough, Brocklesby Park, Lincolnshire, exhibited photographs of woods and plantations ranging from one year up to 120 years, also of the home nurseries and creosoting plant on the estate. This series is specially interesting, inasmuch as the woods on this estate are exceptionally well managed, the owner being an able and enthusiastic forester.

Mr. A. T. Gillanders (forester to the Duke of Northumberland, Alnwick Castle), exhibited two portions of Scots fir stems from "pure" wood, showing the effect of thick as compared with thin planting in branch-suppression and quality of timber.

This is perhaps a more interesting and educational exhibit than appears at first sight. Both specimens of trees as seen in the accompanying photographs are of equal age—about 20 years—and taken from the same wood. Fig. 1 is from a portion of the wood where the trees were originally planted at 3 feet apart, or at the rate 4840 plants per acre. Fig. 2 is from a portion of the wood where the trees were at first planted at 4 feet apart, or 2722 to an acre. It should be noted that though the plants are only a

Fig. 1.

foot wider apart, yet there are almost double the number of plants per acre at 3 feet apart, as compared with 4 feet. Thus when we plant it must be remembered that "number is according to the square of the distance." When planted 3 feet apart it is, of course, obvious that the lower branches will meet more quickly than when planted at 4 feet apart. Hence the difference of branches in the two photographs. But it is only when we come to see the two classes of anticipated boards (Fig. 3) from the prospective trees, that the advantages of thick planting and deferred thinning become emphatically apparent, more especially when cut according to the "bastard" method, as seen in the accompanying sketch, Fig. 4. The sketch referred to will be all the better understood when it is remembered that the "early suppressed" branches of Scots fir as on Fig. 4A are persistent, while the dead branches of many hard woods of similar size would fall off. Now in Fig. 4A it will be seen that mere traces of early branches are found in the heart only. The French people take advantage of this when getting clean boards, and therefore cut the heart or centre out—the narrowest boards (cutting by the "bastard" method) being got from the heart of the log, as seen in Fig. 4A at X. It is of course not absolutely necessary to get rid of *all* knots, but only that class which will depreciate the commercial value of the timber, as seen from Fig. 4B, where dead branches have been absorbed as the tree grew and every cut (as seen from the sketch) must of necessity give dead knots. The practical deduction, therefore, from this exhibit is that thick planting produces branch suppression at the base or "bole" of the tree, just where it is wanted, and that although many trees must successively die in a well managed young wood, they nevertheless do good in their lifetime by leaving improved successors. Again, it must be remembered, that as we plant according to the square of the distance, so heavy thinning, aiming at over regularity, obeys the same arithmetical law and must obviously reduce number and future volume, together with the ultimate production of useless branches and valueless timber, instead of straight clean stems and valuable timber. At the same time improved forestry should produce trees of large average, compatible with the soil on which they are grown, and not a crop of poles.

Another practical question from this exhibit is, how far should

we prune for timber? So far as hardwoods are concerned, we should always cut off dead branches from young trees; and with regard to Scotch fir, it may be said that pruning may be done provided the prospective value would justify the expense. It is, however, we repeat, not so much knots as *dead* knots; thus, for example, first-class flooring reveals knots, but those are always incorporated with the surrounding body, and do not depreciate the practical value.

The same exhibitor showed two photographs illustrating the difference in growth between trees planted in trenched ground as compared with trees planted in pits. Both classes of trees were the same size when planted on the same day, in similar soil alongside each other. The difference, as seen from the photographs, was certainly very marked indeed, and the practical question is, how far can trenching be applied in practice? This, of course, must be decided by discretion, and cannot possibly be adopted in large field or hill areas; but in all clumps or belts in landscape planting for rapid effect and quick increment it is always wise to trench.

Mr. A. D. Richardson, Edinburgh, exhibited twelve quarter-plate photographs illustrating Forestry in Prussia. Those plates were very interesting, but, of course, would have been more educational had they been enlarged. However, they may be considered as "pioneer" photographs, inasmuch as they were taken when the Royal Scottish Arboricultural Society visited Germany in 1895, which visit may be considered the first step towards recognizing the educational value of the principles of Continental Sylviculture.

Mr. Fraser-Story (Lecturer at the University College of North Wales, Bangor) also exhibited an album of views of German Forests.

Mr. C. Richardson, Stamford, Lincolnshire, exhibited a series of nine photographs of *Brown* oak trees framed in brown oak grown in Rockingham Forest, Northamptonshire, and Welbeck, Nottinghamshire, also a photograph of a large ash tree. Those photographs were not only interesting as being pictures of denizens of the forest, but as suggestive of the question—what are the agencies which produce "brown" oak?

Fig. 2

Section IV.—*Timbers.*

In Section IV., which was devoted to Timbers, a very large and interesting exhibit was sent by the Commissioners of His Majesty's Woods and Forests and Land Revenues, but as there were some 23 separate exhibits each interesting in itself, it is obvious that we cannot do any justice to it in this paper.

The University College of Wales, Aberystwyth, exhibited 43 boards of mounted specimens of Timbers of various species from the neighbourhood of Dolgelly, North Wales.

The Duke of Rutland, K.G., Belvoir Castle, exhibited a fine collection of British Timbers, consisting of ¾-inch boards and also hand specimens of timber. This was a portion of a very fine collection at Belvoir, which was shown to the members of our Society when they visited Belvoir in 1901.

The Marquis of Bath, the Earl Egerton of Tatton, the Earl of Yarborough, and Mr. H. J. Elwes of Colesborne, Cheltenham, all exhibited specimens of timber, but it is difficult to generalize from so large and varied collection. There is, however, one feature which may be mentioned. Three boards of Scotch fir (*Pinus Sylvestris*) from Norway, Ireland, and Scotland respectively, and of comparatively equal age, were amongst the exhibits, and it was noticeable that the board from Norway contained by far the largest amount of heart-wood. It is, therefore, a difficult practical question whether, after all, even with improved sylvicultural conditions, we can grow timber equal in quality to that grown in Norway, Sweden, and other countries.

The Marquis of Bath also exhibited five sets of specimens shewing the effects of drying and cutting the roots of young Scots firs. This was really a question of root drying and prolonged exposure to drought, bearing on the question of careless lifting and long transit. It often happens that plants received from a public nursery may have been tied up in the bundle for a very long time prior to being despatched, or otherwise they may have been bought in from the "trade," and therefore been a considerable time in reaching their final destination. It is this evil, together with careless lifting, that often cause so many plants to die after planting. Hence it is a great advantage to have a home nursery, or otherwise get plants from a public nursery comparatively

near the planting operations, so that the bill of mortality may be considerably reduced.

Specimens of good and bad pruning were exhibited from Longleat and Alnwick Parks. With regard to those from Alnwick, it may be said, judging from the printed labels, that two educational features were demonstrated, viz., the exposure of the fallacious prejudice against summer pruning, and the obvious advantage of dressing the cuts with a mixture of tar and paraffin—say half a pint of paraffin to a quart of coal tar. As regards summer pruning, cuts from branches all pruned in July were exhibited, showing the amount of healing by "occlusion" from one to six years respectively. The maximum size of branch recommended to be cut off a comparatively young tree was put down at three inches diameter, and several cuts of this size, done six years ago, were covered and the underlying wood perfectly sound. This latter feature was the result of the dressing referred to. In the same section several other lessons from pruning were demonstrated, but perhaps the most valuable was a specimen shewing the evil effects of not cutting close to the stem and dressing the cuts with an antiseptic.

Associated with this exhibit were two plants revealing the evil effects of "careless" notch planting. It often happens that many young trees die say from three to eight or ten years after planting. This is often attributed to various diseases. If, however, the roots are carefully examined it will be found that they are often doubled up, and in the majority of cases the cause is simply sheer carelessness on the part of many workmen who will not take pains with a class of work which "lives in the future."

Perhaps one of the most interesting exhibits in the whole of this section was that sent by Mr. D. F. Mackenzie, Estate Factor, Morton Hall, Midlothian. The exhibit consisted of four sets of transparencies, transverse sections of British timber, two of which were photomicrographs of tissue. This exhibit was rather of a technical nature, and would require one with a special training to thoroughly appreciate. The sections had been cut by a special arrangement, and they could be used as microscopic or lantern slides. Taken as they are they show the physical features of the wood, or they may be submitted to microscopic examination to show the minutiæ of detail. This is a species of technical information

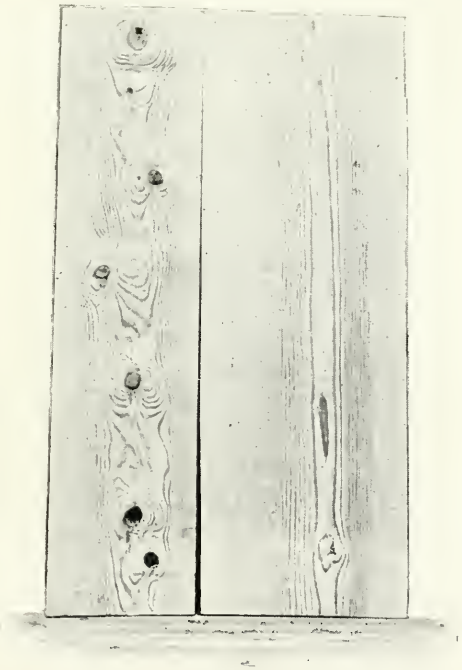


Fig. 3.

that the average intelligent forester is not at all well versed in, and yet until he thoroughly understands it we shall never get foresters to make any original investigations in tree pathology.

Section V.—*Insects and Diseases.*

This section as qualified by the conditions, embraced a very large field indeed, inasmuch as it touched the damage by game and squirrels to the minute microscopic biological organism.

As regards damage done by field squirrels and field mice, examples were sent from Brocklesby Park, Lincolnshire, and Alnwick Parks, Northumberland.

The Marquis of Bath, per Mr. A. C. Forbes, shewed specimens as demonstrating that much vexed question—the "larch disease." In a general way the exhibits were of an evolutionary character; inasmuch as it was shown in all stages from the commencement of "peziza" to the large blister which depreciates the commercial value of the timber. As regards the beginning of the disease, Mr. Forbes demonstrated that peziza (if the cause of the disease) *began with a small dead branch or dead bud and then conveyed the effect to the stem.* This, of course, is contrary to the accepted orthodox opinion of Hartig, who says that it is a wound parasite. Again, there was a suggestive experiment of cutting out the diseased portions from the stems of young trees which, of course, could not be carried out in practice. In fact, the great educational value of this exhibit lay in demonstrating that, after all, we have much to learn as regards "larch disease," and that possibly the practical remedy lies in the direction of improved sylvicultural conditions.

In connection with fungi, which is a very large field in forest pathology, only two other specimens were exhibited by Mr. Gillanders. These, we understand, were borrowed for exhibition purposes. One was *Agaricus melleus* on Scotch fir, and the other damage done by *Nectria cinnabarina* on sycamore—that red-coloured fungus we often see on dead branches during the winter months. It generally begins its havoc on dead branches, but through the action of the mycelium it kills the living tissues in advance. The practical part of the exhibit, however, lay in the association of pruning in connection with this fungus. Thus a

portion of sycamore stem was exhibited which had been pruned in late winter, and as a result the sap had flowed freely during the middle of the day, causing a "flux" deposit on the stem, which became a lodgment for the *nectria* spores. The result of this was that the fungus had killed a considerable portion of the stem. Another portion of sycamore stem showed the beneficial effects of pruning in summer and dressing the cuts with coal-tar and paraffin. The result of following the latter method was that no signs whatever of *nectria* and its damage could be seen.

Specimens of insects and their ravages, both in the living and dead state, were exhibited by Mr. Cecil Warburton, of the Royal Agricultural Society of England; by Messrs. C. S. Orwin and F. O. Theobold, of the South Eastern College, Wye; and by Mr. A. T. Gillanders. It would be entirely impossible within the limits of this paper to give anything like a detailed account of these interesting exhibits. Suffice to say they clearly proved that "forest entomology" is a very large subject.

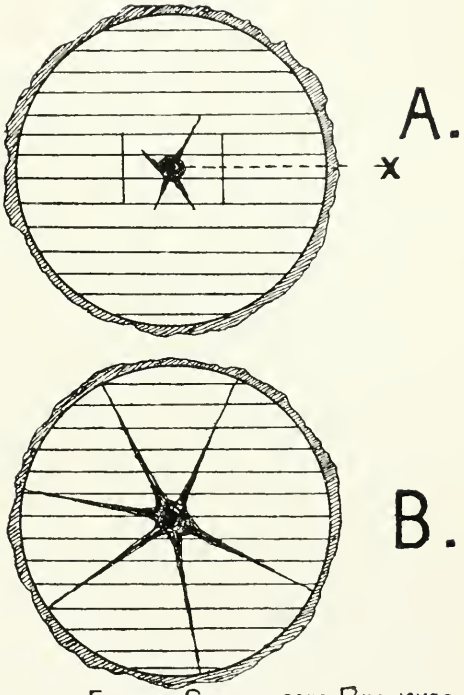
Section VI.—*Plans, Maps, Models, &c.*

Apart from details, this section was broadly made up of creosoted timber and working plans.

Creosoting timber is a method which has long held the field for preservation, but a process of timber preserving by naphthaline, exhibited by the Duke of Buccleuch and Queensberry, K.T., Drumlanrig Castle, took a great many practical men by surprise. A plan of the plant was exhibited, together with stobs of various kinds of waste wood, which had been in use from eight to 14½ years, and which were as good as the day when they were put down.

As regards creosoting proper, a very fine exhibit was shown by the Earl of Yarborough as demonstrating the effect of various soils on creosoted wood. The educational value of this large exhibit demonstrated the advisability of all well-wooded estates having a well equipped creosoting plant (provided creosoting is always considered the best means of preserving timber). As the golden rule of managing all estate property is to look to the *future*, it is indispensable to promote the longevity of all wooden erections on the one hand and save the timber as a valuable asset on the other.

FIG. 4.



X. TRACES OF EARLY SUPPRESSED BRANCHES.

As the foregoing remarks apply more particularly to large estates, a very suggestive experiment of creosoting by "absorption *versus* pressure" was given by Mr. Gillanders.

Herewith we give a copy of the printed explanation which accompanied the exhibit.

"Creosoting by absorption as compared with pressure of 90lbs. to a square inch.

Absorption for one week.

Number.	Kind of timber.	Weight uncreosoted.	Weight creosoted.
1	Beech	8 lbs.	10 lbs.
2	Oak	7½ ,,	8½ ,,
3	Ash	5 ,,	5½ ,,
4	Spruce	6 ,,	6 ,,
5	Scotch fir	5½ ,,	6 ,,
6	Larch	6½ ,,	7 ,,

Pressure.

Number.	Kind of timber.	Weight uncreosoted.	Weight creosoted.	Increase of creosote taken in from pressure over absorption.
1	Beech	8 lbs.	10 lbs.	—
2	Oak	7½ ,,	8½ ,,	—
3	Ash	5 ,,	9 ,,	3½ lbs.
4	Spruce	6 ,,	7 ,,	1 ,,
5	Scotch fir	5½ ,,	8 ,,	2 ,,
6	Larch	6½ ,,	7½ ,,	½ ,,

The object of this experiment is not to shew the contrast of 'pressure' as compared with natural absorption, but rather as suggestive of the probable advantage of small estates adopting absorption, or on the outlying portions of large estates, where the worst class of timber may be cut up and used on the spot, a long way off from the creosoting plant."

The same exhibitor also showed a simple method of a "working plan," of which the following is a copy of the printed explanations.

"Showing method of a simple working plan for 'even-aged' woods, classified according to age.

The 25-inch Ordnance Survey Plans, or tracings of the same,

may be used, perhaps both—the former for reference in the office, the latter for working plan.

Colour.	Age.
Green - - -	1 to 20
Blue - - -	20 to 40
Yellow - - -	40 to 60
Red - - -	60 and upwards

Treatment :—Record of expense, volume and revenue from Blue and Yellow.

Red, or 'clean cut,' regulated by four considerations, viz. :—

1.—Total or comparative aggregate area of all ages on property and volume per acre.

2.—Ratio of yearly increment and prospective value.

3.—Mature crop and rapid depreciation.

4.—Fluctuations of market prices."

Hence it would appear that a forester entering on a large, well-wooded estate, and without any previous method, could classify his whole crop, and work in accordance with the above-suggested principles.

V.—NOTES ON JAPANESE LARCH, 1904.

I.—By Sir Hugh Beevor, Bart.

Scotland is to the fore in forestry as the English Arboricultural Society learned in its visit last summer when viewing the large areas in course of planting with Douglas fir by Mr. Baird. In Scotland, too, we found instances of that new exotic tree (the Japanese larch) already growing as a forest tree more advanced, because earlier planted than any known to us in England.

Although woods planted six to eight years ago give but limited information, now that the nurseryman thrusts this tree constantly on our notice it behoves us to gather all the facts we can concerning it even at early stages of growth.

The owners of Abercairny and Blair Drummond, in Perthshire, and Murraythwaite, Dumfries, afforded Dr Henry and myself facilities for viewing small plantations just coming to age of saleable poles. Mr. John Brown, gardener of Abercairny, and Mr. King the forester at Blair Drummond, kindly showed us those woods and gave us information. The outcome of the notes appended strongly confirms the opinion that the Japanese tree is highly resistant to canker, is less affected by the larch aphis, but suffers more from frost than our valuable European larch.

1.—*Blair Drummond, Lochhill Wood.*—In 1888, a mixed wood of larch, spruce, and hardwood was planted, and at one spot about 40 Japanese larch took the place of European. They stand 10 feet apart, soil poor clayey, rock close beneath, so wet that parallel drains run four yards apart. Most of the neighbouring European larch have been removed, and the remnant are much cankered, while the Japanese trees have no canker, not even on their boughs, only on the lower dead twigs can the Peziza fungus

be detected. These trees have a height of 40 feet and girth of 23 inches, and excel the European, they are large enough to show distinctive form of branching—the boughs extend stiffly like those of *Cedrus libani*, while those of the European larch droop like the *Deodar*.

2—In February, 1896, a three acre belt in an exposed situation was planted four feet apart, half larch, half other conifers two year two year trees slitted in: soil, 12 inches black loam, sand below. Over half the belt Japanese larch were used, and from a distance this section of the plantation looks the taller. Upon close inspection the whole plantation appeared strong and healthy. The Japanese larch were 12 inches in girth and 20 feet high, and in both respects exceeded the European by 20 per cent. They showed neither canker nor aphis. On the lower boughs of the European trees many swellings due to Peziza occurred, but there was very little aphis.

3—*Abercairny*.—Nearly the same age as the last (March, 1897). A sheltered hollow of poor, wet soil, with many open drains, five acres in extent, has been planted four feet apart—half European larch, one-fourth Japanese, one-fourth Scotch or spruce, mixed throughout. Here many stems of the European larch were already cankered, and every tree was full of aphis; while on the Japanese, canker was absent and aphis few to find. Both species had grown rapidly and were somewhat larger than those of Blair Drummond, and no difference in size could be noted in the two kinds.

4.—*Murraythwaite, Dumfriesshire*.—In March, 1896, five acres of an old wooded glen, recently cleared, were planted with larch only, mostly Japanese, four feet apart; soil, gravel; the glen runs S.E. to N.W.—now a tangle of furze, raspberry, and bramble under a flourishing and healthy larch plantation. The trees, not as large as those described above, and at the line where the two species met, but a slight difference in size was observable in favour of the Japanese. The line of junction afforded good opportunity of closely inspecting neighbouring trees, and the identification of Japanese at this stage by breadth of leaf and redness of twig was easy. Accordingly both kinds were closely inspected, with the result that the lower boughs—alive or dead—

of every European tree yielded some Peziza, while none were found on the Japanese specimens.

It was noteworthy that despite the density of the undergrowth, the lowest boughs of the Japanese still held some foliage.

Both sorts were very free from aphis. At the lowest and most exposed position of the plantation were many irregular heads and double leaders of Japanese trees which in two successive seasons had suffered from frost.

Results so far are distinctly encouraging to planters of the tree long cultivated in Japan. Dr. Henry thinks it would have advantages in close planting, retaining healthiness of foliage under denser conditions than the European can bear. It seems quite worth while to plant the new tree for poles where it is known that canker destroys the old kind. With so few years for our experience, recommendation as a timber tree can neither be given nor withheld.

II.—By Dr. Wm. Somerville.

It is always of interest to learn of localities that enjoy complete or partial immunity from larch disease, and two such places have recently come under my notice. I had occasion lately to visit Huntley Manor, some ten miles west of the town of Gloucester, where on the Silurian formation there is a larch plantation some 20 years old in which I failed to find a single blistered stem. The cluster cups of the fungus were observed on two occasions on dead branches, but the parasitic form appeared to be entirely absent.

There was nothing in the character of the situation, or in the composition or treatment of the plantation, to account for this freedom from disease. The elevation is not high (probably under 200 feet), and the wood is practically pure and very dense. Although the plantation occupies the crown of a low hill, it is not a breezy situation, being well sheltered by higher ground to the west.

The other case was brought to my notice by Lord Moreton, who wrote as follows:—"I was shooting on Friday about eight

miles from here, and part of the day we were in a very large plantation of larch, about 18 to 20 years old at a guess. To my surprise, I could only find very slight traces of disease. I did not think that there was such a clean plantation anywhere about here."

When on the subject of larch disease, I may mention that it is a mistake to imagine that the Japanese larch is immune. When the Forestry Committee visited Perthshire a couple of years ago, they found Japanese larches suffering from the fungus, but these trees had first been severely mauled by roe deer. Doubtless, even under normal conditions, this species may contract the disease, but it is certainly much more resistant than the common larch. What the future of this tree in the British Isles may be it is hard to tell. The way in which it beats the common larch in the first year or two is most gratifying, but it seems to lose its lead very soon, and to become a little inclined to be stunted, bearing great quantities of cones when 6 or 8 feet high.

LOCAL MEETING AT BAYHAM ABBEY, TUNBRIDGE WELLS.

On Saturday, July 2nd, 1904, through the kindness of the owner, the Marquis of Camden, a local meeting was arranged by Mr. Leslie S. Wood, F.S.I, in conjunction with the President and Sir Hugh Beevor, at Bayham Abbey, Tunbridge Wells. In response to the circular of invitation, about 50 members and friends were present, including Mr. George Marshall (President of the Society), Godalming; Sir Hugh R. Beevor, Bart., London; Professor W. R. Fisher, London; Dr. D. Mc Bane, Toronto; Mr. W. Schwin, of the German Forest Office; Dr. William Somerville, Board of Agriculture; Dr. G. Newton Pitt, London; Messrs. C. Bagshawe, London; W. R. Brown, Winchfield; G. J. M. Burnett, F.S.I., Elstree; G. E. Champion, Maidstone; F. W. Chant, East Grinstead; C. M. R. Cleeve, Frant; G. W. Cobham, F.S.I., Gravesend; E. Davidson (Assistant Secretary), Haydon Bridge; J. Fraser, Eastbourne; E. Gaisford, Eridge; W. Garratt, Derby; W. P. Genge, East Grinstead; C. H. Greenwood, Petworth; E. W. Hooper, F.S.I., East Grinstead; H. Jonas, F.S.I., London; M. Lambert; George Langridge, F.S.I., Tunbridge Wells; C. A. Leatham, Eastbourne; A. H. Maude, Eastbourne; J. Munford, London; A. North, Penrith, S. I. Oddie, Croxley Green; C. Richardson, F.S.I., Stamford; A. J. Rudkin, F.S.I., Westerham; H. G. Smith, Boughton Monchelsea; W. V. K. Stenning, East Grinstead; E. A. Thomas, London; J. Warnock, Plumstead; F. G. Waterer, Bagshot; and Leslie S. Wood, F.S.I., East Grinstead.

Though the visit was primarily made for a critical study of trees, being one of many tours made throughout the country by the Society for the spread of forestry knowledge, the visit was of physical as well as intellectual charm Bayham Woods are some of the most picturesque of their kind in the country. The estate comprises 12,000 acres, of which a third is occupied by woodland. By the kind permission of the Marquis of Camden, the company, with Mr. C. M. R. Cleeve (the estate agent) acting as guide, were given every facility to traverse the grounds. To trip through miles of undulating forest, through shady glades and pretty woodlands, always affords great pleasure, but when, as on Saturday, the major portion of the company were experts in arboriculture, the charm of the ramble was greatly intensified. To hear an exchange of views on the leading features of the woods made by men well versed in the subject was highly interesting and instructive.

After a short walk on the main road from Frant Station, Larkins Wood was first entered. Taking a narrow path, a lane of chestnut trees was examined. It was explained that their stools—or roots—were of an average age of fifty years but for commercial purposes, namely, the making of hop poles and hurdles, they were now cut every twelve years. In the time of the iron-works—in the 16th to 18th century Bayham was one of the most important centres of the Sussex iron foundry—chestnuts were allowed to grow to about forty years for charcoal smelting. There were a few oaks in the wood, but they were comparatively young.

In Verridge Wood, to which a move was next made, were seen specimens of what are locally called "Furnace Oaks," of which there are but few remaining. They were about 180 years old, with long stems, caused by the old system of allowing the underwood to grow for about forty years for use in the ironworks. One of these trees, of the matured age of 170 years, was slain, and was closely examined by the foresters. It was some 80 feet long. It was incidentally stated by Professor Fisher that the idea was generally entertained that oaks did not grow so quickly in England as on the Continent. It was quite an error to think so; as a matter of fact on good soil oaks grew much more rapidly in England, at the rate of half a foot a year. The fact was lamented that while oaks were felled in this country to-day, there was

no apparent attempt made to replace them by the planting of saplings. If no better attention was given to this matter, in time there would be no English oaks to boast of. Landowners it appeared pay greater attention to the cultivation of chestnuts, because of their quicker commercial return.

To show how coppice was killed by rabbits, Cow Wood was visited. Some splendid specimens of beech and other trees under natural regeneration were seen in the Toll. Some of the beech were said to have seen the light of day for eighty years.

An example of chestnut stools of different ages were met with in Gages Wood. The stools were cut V-shape, which the German Forest Officer present contended was a mistake. Cut in that fashion allowed the water to gather in the cavity, and he explained that in the Fatherland they were cut level with the ground, which enabled the water to run from the trunk.

One of the most picturesque scenes of the morning's tour was off the beaten track, to what was termed Scents Wood plantation. It was originally planted sixty-four years ago, and the party visited it for the purpose of seeing examples of larch grow side by side with chestnut underwood. But to the lay mind the plantation was more attractive for its scenic beauty. In a narrow walk carpeted with soft verdant undergrowth, the branches of tender chestnut trees formed a bower for a quarter of a mile, and the sun gleaming through the foliage gave the finishing touch to a very artistic glade.

Lunch was taken at Hook Green, and after the invigorating ramble of the morning it was thoroughly enjoyed.

Mr. George Marshall, President of the Society, presided, and submitted to the company the "Health of Marquis Camden, who, as they knew, had so kindly placed his beautiful estate at their services that day. They had already been through several interesting woods, but he understood they had the best pleasure of the day to come, in inspecting the beautiful modern abbey as well as the ruins of the old one. If it were not for noblemen and landed proprietors like the Marquis of Camden, they, as a Society, would have a very bad time. It was only by visiting those estates they were able to compare notes and find out what was being done in the interest of arboriculture in this country. (Applause.)

The toast having been honoured,

Mr. C. M. R. Cleeve, in reply, said he was sorry the Marquis of Camden was unable to accept their kind invitation to lunch with them, as he was away from home for a month. He knew, however, it gave his lordship great pleasure to allow the members of the Society to visit the estate, and he had instructed him to give them every facility to do so. The estate was a large one, and the Society that day was only making a very short tour over it. But he hoped they would enjoy the visit during the latter part of the day quite as much as they had in the morning. (Applause.)

The President then submitted "Success to the English Arboricultural Society." He said they were not known as a society in the South of England so well as they were in the North, because the home of the Society was in the North. But like all things that went ahead, the Society had extended itself, and by throwing out its branches had collected a good many statistics in forestry matters in the South, as well as in the North. In the hope of making the Society better known, and to enable more members to join it, they held those local meetings. They could not call it an excursion, because they did not go out for pleasure, but to learn, and to tell the people where they met what the members knew about forestry, and what was being done in the arboricultural world. The object of the Society was for the dissemination of knowledge, a knowledge which was only acquired by visiting the large estates about the country. They did not confine themselves to estates in England, but occasionally visited Scotland, and they had once been as far as the Continent, where they picked up many ideas useful to them as English foresters. Another good thing which the Society did was to see to the circulation of literature on forestry. They published their own *Transactions*, and several very useful articles were written for them by the best men their Society possessed. That was their twenty-third year, and they had now between 750 and 800 members, a large proportion of whom belonged to the North of England. (Applause).

Photo. by Mr. C. H. Greenwood, Estate Office, Petworth.

Members who attended the Local Meeting at Bayham Abbey, Tunbridge Wells, July 2nd, 1904.

The toast having been cordially drunk, the tour was continued.

A visit was paid to the old Bayham Abbey ruins. The Abbey was founded in 1260, and was destroyed by Cromwell. Photographs of the party were taken among the ruins by Mr. C. H. Greenwood, and Mr. W. G. Lewis, and then a visit was paid to the beautiful grounds of the present mansion, which was erected in 1870. Here was seen a lime-tree, which had been planted in 1881 by King Edward VII., when Prince of Wales, and a cedrus planted in 1903 by the late Duke of Cambridge. The Larch plantation was next inspected, and then Stroud Wood, in which it was seen that the chestnuts were gradually killing the other underwood. Originally, Bromley Common, the next place visited, grew mostly larch, with a few beech, ash, elm, and birch. In the lower part the larch were felled about fifty years ago, and the remaining trees gradually cut out in the following years. The whole was replanted about forty years ago, with larch wide apart, and a quantity of ash seedlings formed the bulk of the present seed-sown underwood. In the nursery were found young chestnuts grown from imported seeds. The seedlings are transplanted at one year old, and are kept in the lines until three years of age, when they are planted out in the woodlands to fill up the bare patches when the underwood is cut.

Tea was partaken of at the Brechnock Arms, Frant, and then the party returned to their respective homes by train, after having spent a most pleasant day—marred but to a very small extent by a few showers in the morning.

SUBJECTS OF ESSAYS FOR CURRENT YEAR, (1904-5).

1.—"An account of personal observations upon the internal decay of young trees."

(Professor POTTER offers to give assistance with regard to the microscopical investigations.)

2.—"The best method of raising Trees from seed in the home nursery."

3.—"The growth and freedom from diseases in this country of the various species of Larch."

4.—"Life history of Beech."

5.—"Life history of Scots Fir."

6.—"The suitability of the different varieties of the Douglas Fir for commercial purposes in pure or mixed woods for cultivation in different soils and localities in the British Isles."

7 —"To give the measured crop of timber in the case of three woods, one acre each of pure oak, larch, and beech. The age to be stated, and within 4 years of 60. The soil and conditions to be described and the essay based upon actual instances."

8.—Any other subject connected with Forestry."

Essays to be written on Foolscap Paper, under a *nom de plume;* to bear Essayist's Name and Address in a separately sealed Envelope; and to be in the hands of the Secretary not later than the last day of May, 1905. The Judges will have discretionary power in deciding whether or not the Essays are deserving of an award, and where a Medal is awarded, whether Gold, Silver, or Bronze.

ANNUAL SUMMER MEETING, 1905.
BELGIUM.

The Council beg to intimate that the next Annual Summer Meeting will be held in Belgium, when visits will be made to the Forêts de Soignes, Campine, S. Hubert and Mirwart. Brussels will be made the Headquarters, and it is estimated the cost will not be more than £6 per head exclusive of Ticket to Brussels and back.

Full particulars will be given in due course, but for the convenience of members it may be stated that the date will be as usual, viz., commencing the third week in August.

PARTICULARS OF MEMBERSHIP.

The Secretary will be pleased at all times to forward particulars of Membership, with proposal forms, to any members who may have friends to propose.

The following particulars will be of help in bringing the Society before probable candidates for election :—

Annual Subscription for Proprietors, Land Agents, Nurserymen, and others - - -	£0	10	6
Life Subscription for Proprietors, Land Agents, Nurserymen, and others - - -	5	5	0
Annual Subscription for Head Foresters and Head Gardeners - - - - -	0	5	0
Life Subscription for Head Foresters and Head Gardeners - - - - -	3	3	0
Annual Subscription for Assistant Foresters and Assistant Gardeners - - - -	0	3	0
Life Subscription for Assistant Foresters and Assistant Gardeners - - - -	2	2	0

EXTRACTS FROM FUNDAMENTAL AND BYE-LAWS.

II.—The objects of the Society are the advancement of scientific and practical Arboriculture in all its branches, and the dissemination of a knowledge of such branches of Natural History as are connected with it.

V.—All annual subscriptions shall be payable in advance at the Annual General Meeting.

VI.—Members in arrears shall not receive their *Transactions* while their subscriptions remain unpaid, and any member whose annual contribution to the Society has remained unpaid for three years shall cease to be a member of the Society; and no such member shall be eligible for re-election till he or she shall have paid up their arrears; and an annual list of those parties struck off the roll of members from this cause shall be submitted and read by the Treasurer to the General Meeting in each year.

XI.—A candidate for admission into the Society must be proposed on the form provided for the purpose, which must be signed by the candidate and his proposer, and shall, on payment of his annual subscription, be immediately admitted a member of the Society, subject to the revision of the first General Meeting thereafter. Any member of the Society proposing a new member shall be held responsible for the amount of the first year's subscription of such party.

BACK PARTS OF *TRANSACTIONS* WANTED.

Mr. C. S. Orwin, South Eastern Agricultural College, Wye, is anxious to secure a copy of each of the following *Transactions*.

Vol. II. - Parts 1, 4, and 5.
Vol. IV. - Part 3.

The Secretary will be pleased to hear from any member who can furnish the copies named.

ABSTRACT OF ACCOUNTS

OF THE

ENGLISH ARBORICULTURAL SOCIETY

For the Year ending August, 1904.

FINANCIAL STATEMENT FOR

RECEIPTS.

Deposit in Bank brought forward from last account	£114	6	2
Cash in hand brought forward - -	7	19	2
Advertisements in *Transactions* - - -	9	5	0
Subscriptions - - - - -	216	0	0
	£347	10	4

THE YEAR ENDED AUGUST, 1904.

PAYMENTS.

Expenses of Annual Meeting, 1903 - -			£13 16 9
Use of Rooms for Council Meetings and Councillors' Railway Fares -	£5 8 5		
	8 17 7		
			14 6 0
Silver Medals - - - - -			2 14 0
Reporters and Expenses - - - -			5 8 0
Printing *Transactions* and Postage - -			68 15 2
Stationery and Printing - - - -			15 16 7
Postages, Telegrams, and Railway Carriages -			23 6 10
Expenses — Local Meetings, 1902.			
Lambton Castle (omitted from last year's accounts) - -	£1 13 4		
Darlington - - -	1 15 2		
Bayham Abbey - -	4 2 11		
			7 11 5
Secretary attending Royal Scottish Arboricultural Society's Jubilee Meetings - - -			2 7 6
Removal Expenses and new staging for plants, presented by the Hon. Mark Rolle - -			4 14 9
Book-case to hold back numbers of *Transactions*			5 0 0
Expenses arranging Annual Meeting, 1904 -			6 1 9
Secretary's Salary - - - - -			25 0 0
Assistant Secretary's Salary - - -			15 10 0
			£210 8 9
Deposit in Bank, with Interest -	£124 8 0		
Cash in hand - - -	12 13 7		
			137 1 7
			£347 10 4

Examined and found correct—

BERNARD COWAN, F.R.H.S., } *Auditors.*
WILLIAM CLOUGH, }

JOHN DAVIDSON, *Secretary and Treasurer.*

APPENDIX.

The English Arboricultural Society.

LIST OF MEMBERS

CORRECTED TO AUGUST,

1904.

Those marked * are Life Members.
Those marked † are Honorary Members.

NOTE.—Any Correction required in the Name, Designation or Residence of any Member to be reported to the Secretary.

Date of Election	
1902	Ackroyd, George H., Head Gardener, Howick, Lesbury
1904	Adams, S. J., Forester and Clerk of Works, Adscombe Cottage, Over Stowey, Bridgwater
1904	Adams, J. W. Atken, Resident Agent, Estate Office, Moat Mount, Mill Hill, Middlesex
1882	†Admiralty, Lords Commissioners of, Greenwich Hospital Branch, Whitehall, S.W.
1902	Affleck, R., J.P., Bloomfield, Durham Road, Gateshead
1904	Aitken, G. H., Land Agent, Longleat Estate Office, Warminster
1886	Alexander, William, South View, Hexham
1896	Allan, Alexander, Forester, 41 Bradford Street, Caerphilly, Cardiff
1901	Allbutt, Arthur, 24 Park Square, Leeds
1891	Ames, Victor, Forester, Thornham Cottage, King's Lynn, Norfolk

Date of Election

1902 Anderson, Robert, Assistant Forester, Chatsworth, Derbyshire
1903 Anderson, Robert, Land Agent, Cirencester
1901 Andrew, Duncan, 8 Rainton Terrace, Park Road, Hale, Cheshire
1900 *Aris, J. Whitton, M.A., F.S.I., Lois Weedon House, Towcester, Northamptonshire
1892 Armitage, Fred, 3 Burston Road, Putney, London, S.W.
1882 Armstrong, T. J., Land Agent, 14 Hawthorn Terrace, Newcastle
1898 Armstrong, W., Land Agent, Sunderlandwick, Driffield, Yorks
1893 Armstrong, Addison & Co., Timber Merchants, Sunderland
1895 *Armstrong, Lord, Cragside, Rothbury
1898 Armstrong, Thomas, Timber Merchant, Cockermouth
1904 Arnott, James. 9 Eslington Terrace, Newcastle-on-Tyne
1900 Ashworth, G. W., Timber Merchant, Waterfoot
1902 Atkin, James T., Salisbury House, South Shields
1894 Atkinson, William, Royal Nurseries, Handsworth, Sheffield
1900 Atkinson, W. Penrose, Nurseryman, Handsworth, Sheffield
1902 Atkinson, Geo. Blaxland, Timber Merchant, Newcastle-on-Tyne
1902 Atkinson, Thomas H., St. Eilans, Hexham
1883 †Avebury, The Right Hon. Lord, High Elms, Hayes, Kent
1903 Bagshaw, C., c/o H. S. King & Co., 9 Pall Mall, London
1900 Bailiffe, John, Forester, Poole, South Milford, Yorks.
1900 Bainbridge, T. R., Grove House, How Mill, near Carlisle
1882 Balden, Robert S., Bywell, Leeds Road, Dewsbury
1882 †Balden, John, Dilston, Corbridge-on-Tyne
1895 *Balfour, Professor Isaac Bayley, The University, Edinburgh
1902 Ballantyne, John, Foreman Forester, Chatsworth, Beeley, Rowsley, Derbyshire
1898 Balme, Frank M. P. Jones, J.P., High Close, Ambleside
1893 Barclay, David, Sherbourne, North Leach, Gloucestershire
1899 Barclay, Robert Leatham, 54 Lombard Street, London, E.C.
1901 Barfoot, William S., Assistant Forester, Flimwell, near Hawkhurst, Kent
1895 Barnard, The Right Hon. Lord, Raby Castle, Staindrop, Darlington

Date of Election

1882 Barrett, R. B., Skipton Castle, Skipton
1882 Barrie, James, Forester, Stevenstone, Torrington, N. Devon
1890 Barrie, William,
1902 Barrie, James Alexander, Forester, Harlestone, Northampton
1902 Barrie, David H, Assistant Forester, Pilsley, Bakewell, Derbyshire
1895 *Barron, John, Elvaston Nurseries, Derby
1904 Barton, H. S., Land Agent, Hewshott House, Liphook, Hants
1899 Batchelor, E. J., Nurseryman, Harlow Heath Nurseries, Harrogate
1892 Bayliss, Jones & Bayliss, Victoria Works, Wolverhampton
1882 Beadon, F. W., Land Agent, Estate Office, Huddersfield
1882 Beattie, Thomas, Assistant Forester, Langley Old Hall, Huddersfield
1896 *Beaumont, W. C. B., M.P., Bywell Hall, Stocksfield
1902 *Bedford, His Grace the Duke of, K.G., Woburn Abbey, Bedfordshire
1901 Beeson, Walter, Estate Agent, St. John's College, Oxford
1903 Beeton, H. R., 9 Maresfield Gardens, Hampstead, London
1900 Beevor, Sir Hugh, Bart., 17 Wimpole Street, Cavendish Square, London, W.
1886 Bell, G. H., Wool Merchant, Hexham. (Since dead)
1895 Bell, J. R., Thorpe Perrow, Bedale
1895 Bell, Thomas, Forester, Widdrington Cottage, Acklington
1900 Bell, Charles L., Wolsington Hall, Newcastle-on-Tyne
1904 Benson, R. T., Auctioneer, Parkside House, Darlington
1904 Bentley, Joseph, Chemical Manufacturer, Barrow-on-Humber, Hull
1900 Berry, George, Cockle Park, Morpeth
1892 Bewick, Thomas, Raby Estate Office, Staindrop, Darlington
1897 Bewick, John William, Forester, Streatlam Castle, Darlington
1898 Bewlay, William H., Nurseryman, Hall Santon, Holmrook, Carnforth
1899 Blair, Percy, A.F., Lindon Grove, Nutton Rudly, Cleveland
1902 Bland, George, Architect, North Park Road, Harrogate
1902 Blues, Thomas S., Dean Street, South Shields
1893 Boa, Andrew, Land Agent, Great Thurlow, Haverhill
1895 *Bolam, George, Land Agent, Berwick-upon-Tweed

Date of Election

1899 Bolam, T. W., F.R.H.S., General Cemeteries Superintendent, Sunderland

1901 Bolitho, T. R., Trengwainton, Hea Moor, R.S.O., Cornwall

1898 Bolton, H. Hargraves, New Church, in Rossendale

1900 Bond, Thomas, Head Forester, Lambton Castle, Durham

1895 *Boord, W. B., Beverley, Pateley Bridge, Yorks.

1902 Boorman, Alfred S., Assistant Forester, Bedgebury Park, Goudhurst, Kent

1904 Borthwick, Dr. A. W., D.Sc., Royal Botanic Gardens, Edinburgh

1893 †Bougler, *Professor, F.L.S., F.G.S., 11 Onslow Road, Richmond, S.W.

1903 Bourne & Son, Messrs., Nurserymen, Beckington, Bath

1890 *Bouverie, Henry H. P., 1 Pall Mall East, London, S.W.

1904 Bovill, Geo. B., Land Agent, Rhydycreua, Bettws-y-Coed, North Wales

1900 Bowker, Joseph, Superintendent of Cemeteries, Darlington

1901 Bowles, William A., Head Gardener, Adare Manor, Adare, Co. Limerick, Ireland

1901 Bown, Arthur, Architect, James Street, Harrogate

1902 Boyd, John, Forester, Wood Cottage, Kennishead, Thornliebank

1904 Bradford, Dr. John Rose, F.R.S., 8 Manchester Square, London, W.

1903 Braid, J. B., Forester, The Park, Great Whitley, Stourport, Worcestershire

1898 Brigham, Malcolm C., Westoe Tower, South Shields

1897 Bright, Tom, Estate Agent and Valuer, 10 Mount Street, Grosvenor Square, London, W.

1891 Broadbent, George Alexander, Moor Lane, Netherton, near Huddersfield

1903 Brocklehurst, H. D., Sudeley Castle, Winchcombe

1901 Brodie, Hugh R., Bedford Office, Thorney, near Peterborough

1898 Brown, William, Saw Mills, Brandon, Suffolk

1903 Brown, W. R., Head Forester, Park Cottage, Heckfield, Winchfield, Hants

1896 Brownlow, J. T., Seedsman, The Crescent, Gateshead

1898 Bruce, Nathan M., Forester, Old Hall, Snettisham, Norfolk

Date of Election

1894 Brydon, John, Messrs. Kent & Brydon, Nurserymen, Darlington
1903 Buchanan, Henry, Land Agent, Ashford, near Bakewell
1895 Burnett, G. J. M., Land Agent, Elstree Cottage, Elstree
1890 *Burrill, T. O., Masham, Bedale, Yorkshire
1900 Cadell, George, National Club, 1 Whitehall Gardens, London, S.W.
1899 Caldecott, John A., Long Lawford, Rugby
1902 Caldwell & Sons, Nurserymen, Knutsford, Cheshire
1894 Cameron, Alexander, Forester, Longleat, Warminster, Wilts
1900 Cameron, J. J., A. & J. Main & Co., Limited, Clydesdale Iron Works, Possil Park, Glasgow
1904 Campbell, J. A., Ardnaine, Loch Gilphead, N.B.
1903 Capper, H. F., Estate Agent, The Northgate, Ross, Herefordshire
1903 Capper, Captain R. H. Ord, The Northgate, Ross, Hereford
1887 †Carlisle, The Right Hon. the Earl of, Naworth Castle, Brampton, Cumberland
1901 *Carr, Cuthbert E., Land Agent, 1 Collingwood Street, Newcastle
1901 Carradus, W., Assistant Forester, Wray, Hornby, Lancaster
1895 Carrick, Thomas, Claremont, Clarence Drive, Harrogate
1894 Cartlidge, J. C., Rufford Mill, Ollerton, Newark
1902 Castle, R. Lewis, F.R.H.S., Manager Woburn Fruit Farm, Bedfordshire
1902 Caswell & Bowden, Ltd., Timber Merchants, Newton Chambers, Cannon Street, Birmingham
1899 Ceres Chemical Works, Liverpool
1904 *Champion, G. E , Estate Office, Linton Park, Maidstone
1901 Chapman, F., Forester, Wansford, Northants
1902 Cheeseman, Robert E., Cashier, Chatsworth, Chesterfield
1882 Clark, J. M., Land Agent, Haltwhistle
1883 †Clark, Henry, Messrs. Henry Clark & Sons, The Saw Mills, Haltwhistle
1891 Clark, Thomas, Wentworth Nurseries, Hexham
1891 Clark, George, Land Agent, Haltwhistle
1902 Clark, E. T., The Goddards, Snaith, R.S.O., Yorkshire
1902 Clark, John, Head Forester, Bowdsey Manor, Woodbridge

Date of Election

1891 Clarke, Christopher, Land Agent, Charlcot, Bedale
1892 Clarke, J. W., Land Agent, Guisborough, Yorks.
1902 Clarke, Thomas, Eskmeals, Bootle, S.O., Cumberland
1902 Clarke, Joseph, Forester, Wakefield Lawn, Stoney Stratford, Bucks.
1901 Clayton, John W., Forester, Manby Lodge, Broughton, Brigg
1901 Clayton, Thomas L., Assistant Forester, Manby Lodge, Broughton, Brigg, Lincs.
1904 Cleeves, Charles M. R., Land Agent, Highfields, Frant, Sussex
1900 †Clibran, Miss Annie, Hale Farm Nurseries, Altrincham, Cheshire
1900 †Clibran, Miss Lucy, Hale Farm Nurseries, Altrincham, Cheshire
1901 *Clibran, Wm. R., Nurseryman, Oldfield Nursery, Altrincham Cheshire
1894 Clough, W., The Crescent, Gateshead
1902 Clough, A. H., Castletop, Burley, Ringwood, Hants.
1904 Cobb, Herbert, Land Agent, Higham, Kent
1903 Cocker, James, The Gardens, The Chesters, Hexham
1900 Coles, S H. Cowper, Land Agent, Penmyarth, Crickhowell
1890 Collins, F., Forester, Westmill, Ware, Herts.
1900 Colton, John H. C., c/o G. & T. Coward, Carlisle
1899 Conway, Thomas, Forester, High Legh, Knutsford, Cheshire
1888 Cooper, George, Superintendent of Cemetery, Gateshead
1899 Corking, Joseph T., 42 Jackson Street, Gateshead
1895 Cosans, John, Abbey View, 56 Tragan Avenue, South Shields
1902 †Cottignies, Monsieur, Inspecteur des Eaux et Forêts, Villers Cotterêts, France
1886 Coupar, Robert, Forester, Ashford, Co. Galway
1904 Coventry, B. O., Indian Forest Service, 24 Bolingbroke Grove, Wandsworth Common, S.W.
1882 Cowan, Bernard, F.R.H.S., The Lodge, Harton Cemetery, South Shields
1902 Cox, W. W., Assistant Forester
1899 Cranston, Geo. Dryderdale, Hamsterley, via Witton-le-Wear, Darlington

Date of Election

1896 Crewe, The Right Hon. the Earl of, Crewe Hall, Crewe, Cheshire
1900 Crichton, Thomas, Estate Agent
1901 Crombie, T. Alex., Head Forester, Estate Office, Longhurst, Morpeth
1904 Crooks, James, Eccleston Park, Prescot
1903 Crosland, W., J.P., Estate Office, Buscot Park, Faringdon, Berks.
1903 Crosby-Salt, H., Land Agent, Barrington Park Estate Office, Burford, Oxon.
1894 Crowell-Pollard, J., 3 Whitburn Terrace, South Shields
1902 Crozier, John, Head Forester, Durris Estate, Aberdeen
1884 Cruddas, W. D., Haughton Castle, Humshaugh, R.S.O.
1897 Cumming, W., Forester, Parkhurst Forest, Newport, Isle of Wight
1904 Cundy, Joseph W., Land Agent, Linby, Notts.
1904 Currie, Archibald, 48 Jesmond Road, Newcastle-on-Tyne
1896 *Dalgleish, J. Edward, The Nurseries, Market Weighton
1902 Dalton, Col. H. Wade, Hauxwell Hall, Finghall, R.S.O., Yorks.
1902 †Daubré, Monsieur, Conseiller d'Etat et Directeur des Eaux et Forêts, 78 Rue de Varenne, Paris
1883 Davidson, William, Wordsworth Villa, Coldbath Road, Harrogate
1882 Davidson, John, Land Agent, Haydon Bridge-on-Tyne
1893 Davidson, Edward, Estate Office, Haydon Bridge-on-Tyne
1894 Davidson, John, jun., The Vauce, Langley-on-Tyne
1901 Davidson, W., Head Forester, Manor Yard, Margam, Port Talbot
1901 Davidson, Thomas E., Architect, Alderside, Harton, South Shields
1903 Davison, Richard, Schoolmaster, National School, Belford
1899 Deane, Arthur, Forester, 92 Hood Lane, Sankey Bridges, Warrington
1895 Dent, John W., Wm. Wear & Co., Timber Merchants, Hexham
1896 Dickson, J. T., Nurseryman, Kingswood, Chester
1898 Dickinson, William, Forester, Park House, Arundel, Sussex
1893 Dixon, W., Falkenberg, Harrogate

Date of Election

1901 Dixon, William, Engineer, Harrogate
1891 Dodds, F. W., The Limes, Cressage, Shrewsbury
1885 Dodsworth, F. & W., Collingwood Street, Newcastle-on-Tyne
1894 Doig, C., Forester, Thoresby, Worksop
1897 *Dorman, A. J., Grey Towers, Nanthorpe, R.S.O , Yorks.
1895 Dowell, Joseph, Contractor, 77 Winchester Street, South Shields
1900 Drane, Donald, Land Agent, Raughton, Norwich
1902 Drummie, Alex. C., Assistant Forester, c/o Mr. J. Embleton, Linnolds Wood Cottage, Hexham
1885 †Durham, The Right Hon. the Earl of, Lambton Castle, Fence Houses, Durham
1903 Duthie, J. Alex., Manager, Ben Reid & Co., Ltd., Nurserymen and Seedsmen, Aberdeen
1898 East, William, Florist, Fowler Street, South Shields
1902 Eggar, J. Alfred, Land Agent, Farnham, Surrey
1892 Elder, William, Forester, Cholmondeley Park, near Malpas, Cheshire
1900 *Elliott, B. G., Timber Merchant, 124a Kentish Town Road, London, N.W.
1891 Ellis, Thomas, The Larches, Hexham
1902 Ellison, R. H., Head Forester, Bleach Green, Witton Gilbert, Durham
1904 Eltringham, Alfred, Accountant, 3 Marine Approach, South Shields
1900 Elwes, H. J., F.R.S., Colesborne, Cheltenham
1902 *Eve, Harry T., K.C., Pullabrook, Bovey Tracey, South Devon
1904 Ewing, Guy, F.S.I., Land Agent, Edenbridge, Kent
1900 *Fairfax-Cholmeley, Hugh C., Brandsby, Easingwold
1891 Fawcett, James W., The Grange, Satley, Darlington
1898 Ferguson, John, Dene Croft, Jesmond Park East, Newcastle
1897 Ferguson, R. B., c/o Western New York Nursery Co., Rochester, U.S.A.
1902 Ferguson, R. C. Munro, M.P., Raith, Kirkcaldy
1883 †Fernow, B. E., New York State College of Forestry, Cornell University, Ithaca, N.Y.
1902 Fife, H. L., Land Agent, Staindrop House, Darlington

Date of Election

1893 Finn, S., Marine Drive, South Shields.
1895 Fisher, Professor, Royal Engineering College, Coopers Hill, Englefield Green
1903 Fisher, C. B., Land Agent, Market Harborough
1883 Fleming, William, Tudhoe, Co. Durham
1900 †Fletcher, Dr., Entomologist and Botanist, Central Experimental Farm, Ottawa
1899 Fogg, J. J., Ingleside, Heron Road, Meols, Cheshire
1901 Follwell, P. S., The Gardens, Drumpellier, Coatbridge, N.B.
1883 Forbes, William, 6 Kingston Grove, Woodhouse Lane, Leeds
1898 Forbes, A. C., Durham College of Science, Newcastle
1902 Forbes, Robert, G., jun., Assistant Forester, Hursley Park, Winchester, Hants.
1903 Forbes, R. G., sen., Land Agent, Hursley Park, Winchester, Hants.
1903 Forbes, A., Foreman Forester, Bowdsey Manor, Woodbridge, Suffolk
1890 Ford, John Walker, Enfield Old Park, Winchmore Hill
1899 Ford, Ernest, Head Gardener, The Castle, Bishop Auckland
1902 Forder, Henry, Ruttien Castle, Ruttien, Denbighshire, N. Wales. (Since resigned.)
1898 Forgan, William, Forester, Bowood, Calne, Wilts.
1890 Forrest, A. J., Bedford Office, Thorney, Peterborough
1888 Forster, W. A., Forester, Belgrave Lodge, Pulford, Wrexham
1902 Fortune, Charles, Isalee, Coppice Drive, Harrogate
1899 Foster, Christopher, 212 Pownall Green, Bramhall, Stockport
1902 *Foster, John, jun., Horton-in-Ribblesdale, Settle, Yorks.
1904 Fotheringham, W. Steuart, Murthly, Perthshire, N.B.
1894 Fox, Arthur, Assistant Forester, High Street, Sedgefield, Ferryhill
1902 *Fox, Wm. F., Adbury, Newbury
1903 Foxton, J. T., Head Forester, Riversvale, Burbage, Buxton, Derbys.
1898 Fraser, John, Forester, 121 Latimer Road, Eastbourne, Sussex
1904 Fraser, Wm., Assistant Forester, Lillieshall, Newport, Salop

Date of Election

1886 Gallie, George, Sledmere, York
1899 Gallie, Alex., Head Forester, Estate Office, Somerley, Ringwood
1899 Gamble, J. S., F.R.S., Highfield, E. Liss, Hampshire
1903 Garnett, Thos., Sub-Agent, Ford Cottage, Lumley Castle, Chester-le-Street
1899 Garratt, William, Land Agent, Melbourne, near Derby
1902 Gibson, George R., Tyne Saw Mills, Hexham
1903 Gibson, W. M., Privy Purse Office, Buckingham Palace, S.W.
1902 Gilbert, John, Antony Estate Office, Treval, near Torpoint R.S.O., Cornwall
1895 Gilchrist, John Mc.Bride, Forester, Kinnel Park, Abergele, N. Wales
1902 *Gilchrist, Professor, Durham College of Science, Newcastle-on-Tyne
1897 Giles, C.P , M.P., Copse Hill House, Wimbledon, Surrey
1886 Gillanders, A. T., Forester, Park Cottage. Alnwick
1901 Gilles, Alexander, J.P., Gateshead
1892 Glen, D. A., Forester, Bedgebury Park, Goudhurst, Kent
1893 Glover, Joseph, Timber Merchant, Lathom, near Ormskirk
1902 Glover, F. R., Timber Merchant, Three Oaks, Lathom, near Ormskirk
1902 Glover, Thomas, Timber Merchant, Delamere Villa, Lathom, near Ormskirk
1904 Gordon, Peter, Assistant Forester, Battersby, Ingleby Greenhow, York
1901 Gott, Frank, F.S.I., Land Agent, 3 East Parade, Leeds
1893 *Gough, W., Wykeham, York
1897 Gough, Reginald, Forester, Wykeham, York
1904 Grace, H. W., J.P., Hallgarth Hall, Winlaton, Co. Durham
1888 *Graham, John, Findon Cottage, Sacriston, Durham
1890 Graham, Joseph, 105 South Woodbine Square, South Shields
1894 Graham, David, Forester, The Green, Newbridge-on-Wye, Radnorshire
1900 Graham, W., 40 Crown Street, Newcastle-on-Tyne
1901 Graham, W., Timber Merchant, Alnwick

Date of Election

1896 Grant, William, Wood Bailiff, Aspinall's Farm, Almond Brook, Wigan

1893 Gray, Joseph S., Mill View, Holgate, York

1901 Gray, Robert, Land Agent, Sherborne Park, North Leach, Gloucestershire

1902 Gray, Chas. A., Assistant Forester (Chatsworth Estate), c/o Mrs. Windle, Baslow, S.O., Derbys.

1894 Greene, T., 21 Belgrave Terrace, Newcastle-on-Tyne

1899 Greenwell, His Honour Judge Francis John, Greenwell Ford, Lanchester

1894 Greenwood, Charles H., Petworth Park, Sussex

1903 Grenfell, Arthur P., Cossington, Bridgwater

1882 Grey, C. G., Land Agent, Ballycourcy, Enniscourthy, Co. Wexford, Ireland

1898 Groves, John, Gardener

1902 Griesdale, R. D., C.E., Deputy Waterworks Engineer for the Halifax Corporation, Halifax

1901 Gull, Sir Cameron, Bart., Trilsham House, Yattendon, Berks

1896 Gullachsen, L. H., 10 Pilgrim Street, Newcastle

1902 Gullachsen, L. W., 10 Pilgrim Street, Newcastle

1897 Guthrie, Captain, Linden Gardens, Harton, South Shields

1900 Hadfield, T. W., Estate Office, Mere, Knutsford, Cheshire

1904 Hoggart, Wm., 4 Myrtle Crescent, South Shields

1895 Hall, W. T., High Clere, Newbury

1896 Hamilton, D., Knowsley, Prescot

1903 Hamilton, G. J., Balgowrie, Harrogate

1893 Hankins, Charles, Forester, Wordwell, Culford, Bury St. Edmunds

1903 Hannah, George, Head Forester, Overcourt, Almonsbury, Bristol

1888 Hanson, A., Bailiff, South Elmsall, Doncaster

1902 Harris, H. E., New Lodge, Plaitford, Romsey, Hants.

1904 Harris, G. M., c/o Wm. Fell & Co., Ltd., Royal Nurseries, Hexham

1904 Harvey, John, Forester, Trentham Estate, Stoke-upon-Trent, Staffordshire

1900 Haswell, B., Eslington Villas, Low Fell, Gateshead

1901 Hatcher, Bertram H., Forester, Poplars Green Lodge, Panshanger, Hertford

Date of Election

1893 Havelock, Henry, Forester, Raby Castle, Darlington
1883 Havelock, W. B., The Nurseries, Brocklesby, Lincolnshire
1900 Havelock, Henry, Auctioneer, &c., Hexham (since resigned)
1902 Hawkshaw, J. C., Hollycombe, Liphook, Hants.
1899 Haworth, Alfred, *Timber News*, 84 Leadenhall Street, London, E.C.
1895 *Headlam, Capt. R. A., Gilmonby Hall, Bowes, Darlington
1903 Heaton, K., Land Agent, Alton, Hants
1896 Hedley, T. A., Steward, The Hermitage, Barrasford
1893 Henderson, David, Forester, Bath House, High Melton, Doncaster
1894 Henderson, James, 13 Oxford Street, Whitley Bay
1903 Henry, Dr. A., Kew, London
1893 Herd, W. A., Nurseryman, Penrith
1894 Herd, Isaac, Nurseryman, Penrith
1901 †Herd, Mrs. W. A., 24 Wordsworth Street, Penrith
1885 Heskett, W. J., Land Agent, Penrith
1904 Hibberd, Thos., junr., Assistant Forester, Bolton Abbey, Skipton
1896 Hill, Claud, Nurseryman, Stone
1898 Hill, James Robert
1899 Hill, Principal J. Smith, B.A., Agricultural College, Aspatria
1895 Hilson, John, Forester, Pusey, Faringdon, Berks
1900 Hilson, M., Canford Magna, Wimborne, Dorset
1902 *Hinckes, Ralph T., Foxley, Hereford
1904 Hobbs, Francis, Land Agent, Crown Office, Monmouth
1904 Hollis, John, Forester, Godmersham Estate, Canterbury, East Kent
1896 Holmes, W.
1902 *Hooker, Reginald H., 3 Gray's Inn Place, London, W.C.
1904 Hornby, James J., Knowsley, Prescot
1898 Horsley, M. H., George Horsley & Co., Timber Merchants, West Hartlepool
1894 Hotson, Hugh, Forester
1899 Houblon, Colonel Archer, Hallingbury Place, Bishops Hatford, Essex
1901 Howard, E. Stafford, C.B., Thornbury Castle, Thornbury, R.S.O., Gloucestershire

Date of Election

1904 Howard, A., Sutherland House, 3 Lloyds Avenue, Fenchurch Street, London, E.C.
1885 Hudson, James, Land Agent, Penrith
1904 Huggins, David, Walshford, Wetherley, Yorks.
1895 *Huggon, Thos., Estate Bailiff, Callally, Whittingham, R.S.O.
1889 Hull, Frank, Forester, Lillieshall, Newport, Salop
1904 Hull, George, Assistant Forester, Lillieshall, Newport, Salop
1903 Hutchinson, Wm., Assistant Forester, Knipton, Grantham, Lincolnshire
1901 Hyslop, James S., Land Agent, Middleton-in-Teesdale, Co. Durham
1902 Imeson, John, Assistant Forester, Swinton, Masham
1903 Inglis, Alex., Forester, Bridge Hill, Belper, Derbys.
1904 Innes, G. P. Mitchell, Land Agent, Craig-yr-Haul, Castleton, Cardiff
1897 Irving, G., Estate Agent, West Fell, Corbridge
1900 Iveson, William, Auctioneer, Hexham
1893 James, C. H., Rudchester. Wylam
1898 James, William, Naworth Estate Office, Brampton, Carlisle
1904 James, Arthur J., J P., Edgeworth Manor, Cirencester
1894 Jamieson, D., Barroole Cottage, Foxdale, Isle of Man
1903 Jeffries, W. J., The Nurseries, Cirencester
1902 Jenkin, W. A., Land Agent, Liskeard, Cornwall
1899 Johnson, George, Assistant Forrester
1902 Johnson, Wm., Land Agent, Trench Hall, Gateshead
1898 Johnston, Robert, Forester, Blackhouse, Reston, R.S.O., Berwickshire
1898 Johnston, Andrew, Assistant Forester, High Street, Garlistown, Wigtownshire
1903 Johnstone, Robert, Assistant Forester, Chatsworth Estate, Beeley, Rowsley, Derbys.
1887 *Joicey, Edward, Blenkinsopp Hall, Haltwhistle
1887 *Jonas, Henry, Surveyor, 23 Pall Mall, London, S.W.
1904 *Jonas, H. Driver, 23 Pall Mall, London
1903 Jones, Richard, Head Forester, West Dean Park, Chichester
1893 Kelly, J. G., West View, Pontefract
1904 Kendle, Geo. Robert, Land Agent, Wilton, Salisbury
1896 Kennedy, John, Gogar Estate Office, Haugh Farm, Cambus, N.B.

Date of Election

1903 Ker, A. P., Land Agent, Cattle Market, Hexham
1895 Kidd, William, Forester, Harewood, Leeds
1904 Kimm, John J., Head Forester, Chesters, Humshaugh-on-Tyne
1904 Kininmouth, Wm., Assistant Forester, Wynyard Park, Wolviston, Durham
1902 †Lafosse, Monsieur, Inspecteur des Eaux et Forêts, Dep. de l'Agriculture, 78 Rue de Varenne, Paris
1897 Laidlaw, P. O., Stone Croft, Fourstones
1902 Laidlaw, John, Foreman Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.
1902 Laidler, G. G., 40 Northumberland Street, Newcastle-on-Tyne
1897 Laine, James, Estate Steward, Shorewell, via Newport, Isle of Wight
1897 Laine, F. J., Head Forester, Preston Hall Estate, Aylesford, Kent
1898 Laing, James Henry
1899 *Laird, D. P., Pinkhill, Murrayfield, Edinburgh
1902 Laird, John, Forester, Buckland, Bwlch, R.S.O., Breconshire, Wales
1897 *Lamb, Major S. E.
1897 *Lamb, R. O., Hayton Hall, How Mill, near Carlisle
1901 Lascelles, Hon. Gerald, The King's House, Lyndhurst
1899 Laws, Councillor, Gateshead
1901 Lee, Henry, Assistant Forester, Cholmondeley Park, Malpas, Cheshire
1901 Lee, Edward S., Woodlands, Hexham
1903 Lee, Wm., Land Agent, Guildford
1900 *Leeds, Duke of, Hornby Castle, Bedale
1902 Lees, Wm., Foreman Forester
1896 Legard, D. C., Heighington, Lincoln
1900 Lewis, Thomas, Fair Oak House, Roath Park, Cardiff
1902 Lewis, J. H., M.P., N. Side, Clapham Common, S.W.
1903 Lewis, H. C., Land Agent, Whittlebury, Towcester
1890 *Leyland, C. J., Haggerston Castle, Beal, Northumberland
1904 Liddell, George, The Grange, Kimblesworth, via Chester-le-street
1890 Lincoln, Edward H., 3 Market Place, South Shields

Date of Election

1902 Linskill, Thomas, Mowbray House, 113 East Parade, Harrogate
1900 Little, Adam, Mousen Hall, Belford
1903 Lloyd, Cyril, Assistant Forester, Chatsworth Estate, Edensor, Bakewell, Derbys.
1899 Lock, Hampton C., Assistant Forester, Middleton, Tamworth
1897 *Lockey, W., Tragan Avenue, South Shields
1883 Lockhart, L. C., Solicitor, Hexham
1883 Lockhart, H. F., Hexham
1899 Lockhart, Peter, Land Agent, Estate Office, Corby Castle, Carlisle
1894 Luke, Thomas W., Forester, Bridge End, Warden, Hexham
1904 Luttrell, J. F., Dunster Castle, Dunster, Somerset
1896 Mabane, J. R., Balfe House, Park Terrace, South Shields
1902 MacDonald, George N., Forester, Raith, Kirkaldy
1902 Macdonald, John, Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.
1898 Mack, Robert, Nurseryman, Catterick, Richmond, Yorks.
1904 Macky, M., Leather Merchant, 36 Highbury, West Jesmond, Newcastle-on-Tyne
1891 Maister, C. L. N., Swinton Estate Office, Masham
1902 Mansfield, John Henry, Assistant Estate Agent, Howick, Lesbury, Northumberland
1896 *Marchant, R. C., M.R.A.C., F.C.S., P.A.S.I., 25 Harward Road, Gunnersbury, London, W.
1895 *Margerison, Samuel, Calverley, Leeds
1892 Marsden, James, Assistant Forester, Clifton Castle, Bedale
1890 Marsh, W. D., Land Agent, Broughton, Skipton-in-Craven
1892 Marsh, C. H.
1889 *Marshall, S. A., Skelwith Fold, Ambleside
1883 *Marshall, R. D., Castle Rigg Manor, Keswick
1895 Marshall, George, Land Agent, Frimstone, Liphook, Hants
1892 Marshall, T. D., Solicitor, King Street, South Shields
1898 Marshall, W. H., Place Fell House, Patterdale, Penrith
1899 Marshall, Peter, Forester, Euston, Thetford, Suffolk
1903 Marshall, F. C., Riseholm Grange, Lincoln
1903 Marshall, M. W., Timber Merchant, Godalming, Surrey

Date of Election

1899 Martin, Thomas, F.S.I., Hampden House Club, London N.W.
1901 *Martin, James, Wood Manager, Knipton, Grantham
1895 *Masham, The Right Hon. Lord, Swinton, Masham
1891 Mason, John, Estate Office, Grantley, Ripon
1904 Mason, J. E., Horticultural Chemical Merchant, Barrow on-Humber, Hull
1883 Matheson, Thomas, Nurseryman, Morpeth
1903 Matthews, Councillor J. L. Hampton, Scalby House, Kent Road, Harrogate
1902 Maude, A., Ivy Mount, Eastbourne, East Sussex
1899 Maudlen, J. C., 43 Osborne Road, Newcastle-on-Tyne
1891 *Maughan, John, P.A.S.I., Land Agent, Jervaulx, Middleham
1904 Maw, Percival T., Land Agent, Holmesdale, Nutfield, Surrey
1902 May, George, Simonside Hall, South Shields
1891 Mc.Andrew, P., Forester, Prudhoe Hall, Prudhoe
1904 Mc.Beath, David, Forester to Liverpool Corporation, Abbey Village, Withnell, Lancs.
1900 Mc.Bride, D., Gardener, High Legh, Knutsford, Cheshire
1895 Mc.Cracken, William, Land Agent, Englesea House, Crewe
1899 Mc.Dougall, Alexander, Forester, Duncombe Park, Hemsley, R.S.O., Yorks.
1903 Mc.Gibbon, R., Forester, Wentworth, near Rotherham
1902 Mc.Kechnie, Angus, Assistant Forester, c/o Mr. A. T. Gillanders, Alnwick Castle, Alnwick
1900 Mc.Lean, Duncan, Forester, Willingham House, Market Rasen, Lincs.
1892 Mc.Que, Alexander, Assistant Forester, Pulford, Wrexham
1893 Mc.Rae, A.
1902 Menzies, James, Forester, Pitney, Langport, Somersetshire
1902 Methven, John, Thomas Methven & Sons, Nurserymen, Edinburgh
1899 Michie, James, Forester, The Nurseries, Orwell Park, near Ipswich
1899 *Middleton, Sir Arthur E., Bart., Belsay Castle, Newcastle-on-Tyne
1900 Middleton, S., 173 Portland Street, Newcastle-on-Tyne

Date of Election

1902 *Middleton, Professor, Agricultural Department, Cambridge University
1904 Mildred, Geo. B., Land Agent, Preston House, Cirencester
1899 Miles, Charles, Timber Merchants, Stamford, Lincolnshire
1902 Miller, J. W., F.S.S., Union Club, Trafalgar Square, London, S.W.
1901 Miln, T. E., Nurseryman, Darlington
1894 Milne, William, W. Fell & Co., The Royal Nurseries, Hexham
1902 Milne, A., Nurseryman, 32 Hanover Street, Edinburgh
1896 Milnthorpe, John, Nurseryman, Gowlands, Westgate Road, Newcastle-on-Tyne
1884 Mitchell, John, Forester, Strid Cottage, Bolton Abbey, Skipton
1890 †Mitchell, Mrs., Strid Cottage, Bolton Abbey, Skipton
1884 Mitchell, Francis, Park Farm Office, Woburn, Bedfordshire
1902 Mitchell, F. W., Welbeck, Worksop
1904 Mitchell, John, junr., Assistant Forester, Bolton Abbey, Skipton
1899 Moffat, R., Head Gardener, Leazes Park, Newcastle-on-Tyne
1899 Moir, E. Mc.Arthur, 46 Melville Street, Edinburgh
1902 †Molleveaux, Monsieur, Conservateur des Eaux et Forêts, Amiens, France
1894 Molyneux, Job, Curraghmore, Portlaw, Ireland
1902 Moore, Charles, Assistant Forester, Bedgebury Park, Goudhurst, Kent
1896 Moran, J. A., Editor, *Land Agents' Record*, 149 Strand, W.C.
1900 More, W. H., Crown Receiver for Wales and County Monmouth, Noddfa, Harlech
1904 Moreton, Lord, Sarsden House, Chipping Norton
1903 Morgan, H., Forester, Pontygwaith Farm, near Preharris, R.S.O., S. Wales
1903 Morrison, W. J., Head Master, Haydon Bridge Shaftoe Grammar School, Haydon Bridge
1901 Mortimer, M. W., Land Agent, Culford, Bury St. Edmunds
1902 Moses, George H., Coniscliffe Road, Darlington
1897 Moult, John, Underhill, Low Fell, Gateshead
1902 Mowat, George, Assistant Forester, Cotgrave, Nottingham

Date of Election

1902 Muir, John, Assistant Forester, Culshobben, Portwilliam, Wigtownshire, N.B.

1895 Mulford, Fred, Timber Merchant, 1 Elm Grove Road, St. David's, Exeter

1901 Munford, James, 143 and 145 Queen's Road, Westbourne Grove, Bayswater, London, W.

1902 Munro, Hugh, Forester, etc., Garden Cottage, Holkham, Norfolk

1898 Murray, Matthew, West Villa, The Green, Wallsend. (Since resigned.)

1899 Naylor, R. A., Cuerden Hall, Thelwell, Cheshire

1904 Neate, A. W., junr., Land Agent's Pupil, Newbury, Berks.

1901 Nelthorpe, R. N. S., Scawby Hall, Lincolnshire

1886 *Newbiggen, John T., Kennedy & Co., Nurserymen, Dumfries

1894 †Nicholson, George

1902 Nicol, James, Forester, Croxteth, Liverpool

1899 Nixon, J. J., Cambo R.S.O., Northumberland

1903 Nixon, George, Estate Office, Shawdon, Glanton R.S.O., Northumberland

1902 *Northumberland, His Grace the Duke of, K.G., Alnwick Castle, Alnwick

1899 Oakley, John H., 10 Waterloo Place, Pall Mall, London, S.W.

1902 Oddie, S. Ingleby, Chess Side, Croxley Green, Herts.

1903 Ord, George, Causey Wood, Marley Hill, Newcastle-on Tyne

1895 Orkney, W. C., Surveyor's Office, Montrose Royal Asylum

1898 Ormiston, Walter, Lee Walton & Co., Timber Merchants, Langley-on-Tyne

1904 Orwin, C. S., South Eastern Agricultural [College, Wye, Kent

1904 Osmond-Smith, F. H., Land Agent, Lewes Villa, Uckfield, Sussex

1900 Pain, W. H., F.S.I., Land Agent, Carnarvon Estate Office, Bingham, Notts

1895 Palliser, James, Rose Bank, Blackhill, Co. Durham

1896 Palliser, William, Blackhill, Co. Durham

1900 Palliser, R. S., Royd Mount, Grove Road, Harrogate

Date of Election

1903 *Parker, Thomas, Estate Office, Highclere, Newbury, Berks.
1903 Parsons, R. M. P., Land Agent, Misterton, Crewkerne, Somerset
1900 Pearson, G., The Glen, Lancaster Road, Harrogate
1893 *Peel, Edward L., 9 Whitehall Place, London, S.W.
1902 †Peiffer, Monsieur Inspecteur des Eaux et Forêts, Compiegne, France
1902 Perkins, Henry, c/o Messrs. Wood & Ingram, The Nurseries, Huntingdon
1902 Perkins, John Edward, Nurseryman, Billing Road Nurseries, Northampton
1902 Perkins, John Edward, jun, Nurseryman, Billing Road Nurseries, Northampton
1898 Perry, James, Assistant Forester, Bury, near Dulverton, Somerset
1896 Petrie, David, Westoe Hotel, South Shields
1900 Pewson, Leonard, 80 Cheapside, London, E.C.
1899 Philip, William W., Factor, Gigha, Argyleshire, N.B.
1904 Piek, S., Nurseryman, 5 Leazes Terrace, Hexham
1904 Pigot, J. L., c/o Grindlay & Co, 54 Parliament Street, S.W.
1902 Pike, Thomas, Saltwell Hall, Saltwell Lane, Gateshead-on-Tyne
1899 Pitcaithley, Alex., Forester, Jeannie Bank, Old Scone, Perth
1904 Pitt, Dr. J. Newton, 15 Portland Place, W.
1883 *Plummer, Arthur B., Architect, Prior's Terrace, Tynemouth
1894 Pollard, Henry, 72 and 74 Fowler Street, South Shields
1895 Pope, William, Gardener, Highclere, Newbury
1896 Pope, Alfred, Assistant Forester, Longleat, 124 Horningsham, Warminster, Wilts.
1902 Popert, E. P., Superintendent Forester, Braceland, Collford, Glous.
1902 Portal, Maurice, Land Agent, Estate Office, Beaufront Castle, Hexham
1895 *Portland, His Grace the Duke of, Welbeck, Worksop
1895 Potter, Professor, Durham College of Science, Newcastle-on-Tyne
1904 Powell, James, Caerphilly, Wales
1900 Price, Jos, Estate Office, High Legh, Knutsford, Cheshire.

Date of Election

1899 Pride, Lieut.-Col. W. H., 5 Lancaster Avenue, Sefton Park, Liverpool
1904 Pritchard, H., St. Fagans, Cardiff
1901 Purvis, Robert, Broughton Road, South Shields
1900 Rafn, Johannes, Tree Seed Merchant, Skovfrökontoret, Copenhagen—F.
1895 Ralston, W. H., Land Agent, Streatlam Castle, Darlington
1904 Readhead, John, Shipbuilder, Rockcliffe, Westoe, South Shields
1902 †Récopé, Monsieur, Administrateur des Eaux et Forêts, 78 Rue de Varenne, Paris
1893 Reed, J. T., Caldwele Villa, South Shields
1902 Reid, Hugh, Forester, Ashton Court, Long Ashton, near Bristol
1902 Renton, George, Estate Agent, Grove Villas, Queen Parade, Harrogate
1904 Renton, T. R. V., Surveyor and Auctioneer, Albert Street, Harrogate
1901 Richardson, C., Land Agent, 13 Barn Hill, Stamford
1901 Richardson, E. C., Land Agent, 13 Barn Hill, Stamford
1901 Richardson, C. E., Forester, Easton Hall, Grantham
1895 *Ridley, The Right Hon. Lord Viscount, Blagdon, Cramlington. (Since dead.)
1904 Riley, L. J. C., Agent, Putley Court, Ledbury, Herefordshire
1892 Ritson, Morley, Timber Merchant, Hexham
1890 Roberts, Thomas, Forester, Park Gate, Easeborne, Midhurst, Surrey
1898 Roberts, John, Forester, The Livox, St. Arvans, Chepstow
1895 Robertson, Thomas, Woodlawn, Co. Galway, Ireland
1900 *Robertson, Watson Askew, J.P., Ladykirk, Norham
1901 Robertson, J. P., Forester, Chatsworth Estate, Edensor, Bakewell, Derbys.
1888 Robinson, J. F., Timber Merchant
1900 Robinson, Robert, Head Forester, Angerton, Morpeth
1900 Robinson, Robert, Forester, 10 Summer Hill, Shotley Bridge
1882 Robson, J. W., Joseph Robson & Son, The Nurseries, Hexham
1902 Robson, Robert, 42 Northumberland Street, Newcastle-on-Tyne

Date of Election

1901 Rodom, E. S., 13 Beamsley Terrace, Cardigan Road, Leeds
1904 Rogers, John P., Penrose, Helston, Cornwall
1892 *Rolle, The Hon. Mark, Stevenstone, Torrington
1902 Rolleston, Sir John F. L., M.P., Glen Parva Grange, Leicester
1891 Ross, George, Joseph Robson & Son, The Nurseries, Hexham
1896 Ross, A. J., Assistant Forester, Skipton Castle, Skipton, Yorks.
1902 Rowland Bros., Timber Merchants, Fenny Stratford, Bletchley
1901 Royce, D. N., Auctioneer, etc., Oakham
1901 Rundle, Edward C., Bedford Office, Tavistock
1895 Rutherford, J. A., Land Agent, Highclere, Newbury
1883 Sample, Thomas, Land Agent, Bothal Castle, Morpeth
1883 *Sample, C. H., Land Agent, Matfen, Corbridge
1902 Santer, William, Timber Merchant, Hawkhurst, Kent
1904 Saunders, A., Forester, Delamere Forest, Kingswood Cottage, Kingswood, Frodsham
1904 Sawyer, J. A., Land Agent, Winchester, Hants.
1901 Schlich, Dr., Royal Engineering College, Coopers Hill, Englefield Green
1904 Scholfield, E. P., Estate Office, Somerley, Ringwood, Hants
1903 Schott, Dr. Peter Carl, Knittelsheim, Palatinate, Germany
1904 Score, H. B., Lathom Park Schools, Ormskirk, Lancashire
1883 Scott, John, Land Agent, Newton, Stocksfield
1895 Scott, John D., Estate Office, Brushford, Dulverton
1893 Scott, James, Timber Merchant, Hill Crest, Ryton
1898 Scott, A., Forester, Southwick, Fareham, Hants.
1902 Scott, John S., Wythenshawe Estate Office, Northenden, Cheshire
1896 Seaton, A., Forester, Hawarden, Chester
1904 Sewell, Wm. W. R., Brandlingill, Cockermouth
1897 Shearburn, H., Munstead, Godalming, Surrey
1901 Shearburn, R. B., The Hall, Snaith, R.S.O., Yorkshire
1899 Sheriff, Stephen, The Bungalow, Westoe, South Shields
1883 Shipley, Ralph, Woodman, Plunderheath, Haydon Bridge-on-Tyne

Date of Election

1883 Shipley, Edward, 20 North Road, Darlington
1898 Shortt, John, Forester, Blagdon, Cramlington, Northumberland
1901 Short, George, Assistant Forester, Rose Cottage, Ravensworth, Gateshead
1898 Simpson, W. A., Skipton Castle, Skipton, Yorks.
1903 Simpson, Alderman David, C.C., Four Ash, Harrogate
1904 Skewis, Edwin, 29 Park Place, Hyde Park, London, W.
1885 Slater, Herbert, Forester, Sandon, Stone, Staffordshire
1901 Slater, Ed., Supt. Elswick Cemetery, Newcastle-on-Tyne
1884 Smith, David, Woodman, Scremerston, Berwick-upon-Tweed
1887 Smith, Stephen, Bailiff, Blenkinsop, Haltwhistle
1888 Smith, William, Timber Merchant, Gunnerton, Barrasford
1892 Smith, J. M., Kensington Terrace, South Shields
1895 Smith, John, Timber Merchant, Gunnerton, Barrasford
1896 Smith, J. O., Derwentside Terrace, South Shields
1901 Smith, James, Estate Bailiff, Matfen, Corbridge-on-Tyne
1903 Smith, Harry, Woodside Cottage, Scremerston, Berwick
1904 Smith, Cuthbert, Land Agent's pupil, Thorney, Peterborough
1904 Smith, Chas. junr., Nurseryman, Grindleford Bridge, Sheffield
1901 *Smyth, Hugh Lyle, J.P., D.L., Barrowmore, Chester
1892 †Somerville, Professor, The Board of Agriculture, Whitehall, S.W.
1891 Spence, John, Timber Merchant, Ripon
1900 Spencer, Thomas, Head Gardener, Goodrich Court, Ross, Herefordshire
1904 Stamer, W. E., Land Agent, Lilleshall Lodge, Newport, Shropshire
1904 Stanworth, D., Assistant Forester, Newport, Salop
1903 Staton, John E., Schoolmaster, High Legh, Knutsford, Cheshire
1904 Stenning, W. V. K., Halsford, East Grinstead
1891 Stewart, Dr., Hexham
1900 Stewart, Alexander, Forester, Shadwell Court, Thetford
1901 *Stirling, C., Gargunnock, Stirlingshire
1902 Stock, W. F. K., County Analyst, Darlington
1901 Stocks, Ben, Architect, St. Peter's Street, Huddersfield

Date of Election

1894 Stokes, Councillor Henry, 4 Logan Terrace, South Shields
1903 Stook, J. E. H., P.A.S.I., M.R.A.C., Land Agent and Surveyor, 2 Palace Yard, Hereford
1893 Storie, W., Forester, Whitway House, Newbury, Berks.
1898 Storie, Wm., Head Forester, Gulworthy, Tavistock, Devon
1902 Storie, A. B., Forester, "Goodwood," East Dean, Chichester, Sussex
1904 *Story, Fraser, Lecturer on Forestry, University College of North Wales, Bangor, Wales
1885 *Straker, J. H., Howden Dene, Corbridge
1890 *Straker, J. C., The Leazes, Hexham
1900 Straker, F., Angerton, Morpeth
1904 Studdy, T. E., Estate Office, Basing Park, Alton, Hants
1894 Surtees, R. G., Contractor, Colwell, Barrasford
1904 *Sutherland, His Grace the Duke of, K.G., Lillieshall House, Newport, Shropshire
1894 Swales, John, Fowler Street, South Shields
1901 Swallow, Edward, Estate Agent, Orton Estate Office, Peterborough
1900 Swinburne, Sir John, Capheaton Hall, Newcastle-on-Tyne
1898 Swinney, William, 10 Wentworth Terrace, South Shields
1893 Symm, John, Engineer, Newton, Stocksfield
1902 Tate, George, Forester, Grinkle Park, Lofters, York
1887 Taylor, Thomas, Chipchase Castle, Wark-on-Tyne
1898 Taylor, John
1898 Taylor, John, Lansdowne House, South Shields
1901 Taylor, John, Supt. St. Andrew's Cemetery, Newcastle-on-Tyne
1902 Taylor, George, Assistant Forester, Foresters' Bothy, Newton Hanzard, Wolviston, Stockton-on-Tees
1903 *Taylor, W. F., Nurseryman and Seed Merchant, Lytton Nurseries, Stevenage, Herts.
1903 Taylor, Chas., Assistant Forester, Highclere, Newbury, Berkshire
1903 Taylor, Jas., Forester, Hainton, Lincoln
1904 Taylor, Robert, Assistant Forester, Etal, Cornhill-on-Tweed
1902 Temperley, Nicholas, J.P., 4 Carlton Terrace, Low Fell, Gateshead
1898 Theakston, Thos., J.P., Billfield, Masham, Yorks.

Date of Election

1903 Thimbleby, A. C., 47 Queen's Road, Reading, Berks.
1902 Thomas, J. H., North Lodge, Wimpole Estate, near Royston, Cambs.
1904 Thomas, E. Aubrey, 6 Brechin Place, Gloucester Road, London, S.W.
1902 Thomlinson, Charles, Land Agent, Bellingham
1902 Thomson, John, West End Park, South Shields
1901 Thomson, Robert, Woods Foreman, 57 Park Hill, Ampthill, Beds.
1902 Thomson, F. J., Land Agent, Baggrow Brow, Brayton, Carlisle
1902 Thomson, Walter, Castle Gardens, Alnwick
1892 Thornton, Councillor, Thorney Terrace, South Shields
1900 Thornton, George, Gardener, Ingleton, Darlington
1903 Thwaites, Wm., Joiner, Swinton, Masham, Yorks.
1903 *Timber Trades Journal*, The Editor of the, 164 Aldersgate Street, London
1902 Tindle, John, Solicitor, Westoe, South Shields
1901 Tomkinson, James, M.P., J.P., Willington Hall, Tarfully, Cheshire
1893 Thomlinson, Wilson, Forester, Clumber, Worksop, Notts.
1899 Totty, Harry, Forester
1902 Townend, E., Land Agent, 1 Abbey Place, Selby, Yorkshire
1902 Towner, John, Assistant Forester, Maypole Lane, Goudhurst, Kent
1902 Tremlett, Walter W., Land Agent, Uffington, Stamford
1893 Tristram, Rev. Canon, D.D., F.R.S., The College, Durham
1904 Trussler, H., Assistant Forester, Ardgowan, Inverkip, Greenock
1902 Tully, Jas. B., Assistant Forester, Dalmeny Park, Edinburgh
1901 Tuppeney, William, Assistant Forester, Seacox Heath Lodge, Hawkhurst, Kent
1900 Turnbull, Andrew, Assistant Forester, Picktree, Chester-le-Street, Co. Durham
1895 Turner, Warner, Land Agent, Welbeck
1902 Twelves, William, Foreman Forester, Chatsworth Estate, Ashford, Bakewell
1901 Vayro, John, Assistant Forester, Healey, Masham, Yorks.

Date of Election

1893 *Veitch, Harry James, 34 Redcliffe Gardens, South Kensington, London, S.W.
1902 Wade, Alderman, North Road, Halifax
1901 Wainwright, Ormond F., Forester, Belton, Grantham
1892 Wakenshaw, J. W., Runnymede, Kenton, Newcastle-on-Tyne
1890 Walker, J. J., Timber Merchant, Orchard House, Hexham
1897 Walker, J. D., Solicitor, 21 Pilgrim Street, Newcastle
1892 Walton, C. E., Accountant, King Street, South Shields
1891 Ward, D. M.
1901 Ward, R. R., Morewell Farm, Tavistock
1892 Wardle, J. P., Timber Merchant, South Shields
1901 *Waring, William A., Farningham Hill, Dartford, Kent
1903 Warnock, J., Government Timber Inspector, 30 Hanover Road, Plumstead, London
1900 Watson, John Graves, 11 Chester Crescent, Newcastle-on-Tyne
1902 Watson, Thomas, Steward, Model Farm, Porter's Park, Shenley, Herts.
1896 *Watney, Daniel, 33 Poultry, London
1901 Watney, Herbert, M.D., Buckhold, Pangbourne, Berks.
1883 *Watt, James, Little & Ballantyne, Carlisle
1895 Watt, J. W., Little & Ballantyne, Carlisle
1896 Watt, Alex., Land Agent, The Grove, Ravenglass, Carnforth
1899 Watt, George Frederick, 6 Knockhall Grove, Greenhithe, Kent
1899 Watt, Mrs. Leah C., 6 Knockhall Grove, Greenhithe, Kent
1903 Waterer, F. Gorner, The American Nursery, Bagshot, Surrey
1894 Watters, John, Forester, Ridley Hall, Bardon Mill, Carlisle
1902 Weigall, A. G., Land Agent, Hardingstone, Northampton
1903 Weir, Alex., Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.
1901 Wells, Ed. S., Assistant Forester, Flimwell, near Hawkhurst, Kent.
1901 Wells, Hugh, Assistant Forester, Flimwell, near Hawkhurst, Kent
1890 Welton, William, Land Agent

Date of Election

1902 Went, Robert T., Forester, Bute Workshops, Blackmeir, Cardiff
1903 Wheeler, H. J., Nurseryman, Warminster
1904 Wheldon, M. L., P.A.S.I., Land Agents' Assistant, c/o F. Handley, Esq., 17 St. Mary's, York
1893 Whitaker, John, Forester, Abbeystead, Lancaster
1902 Whitcombe, George E., Park Farm, Woburn, Beds.
1890 White, William, Forester
1899 White, Joseph, House and Land Agent, 58 King Street, South Shields
1901 White, John, Forester and Bailiff, Appleby Hall, Doncaster
1901 White, Lieut.-Col. F. A., Land Agent, Burghley Estate Office, Stamford.
1904 White, John, Assistant Forester, Wynyard Park, Wolviston, Durham
1904 Whitehead, Robert Henry, Bede College, Whitley Bay
1901 Whitmore, T. G., Timber Merchant, Bury St. Edmunds
1895 Whittingham, W., Estate Office, Sledmere, York
1894 Wilcox, Albert, Forester, Linley, Brosley, Salop (Since resigned)
1892 Wilkinson, W., Assistant Forester.
1902 Wilkinson, Fred, Nidd Valley Saw Mills, Dacre Banks, via Leeds
1901 Willians, Jas. H., Assistant Forester, Staindrop, Darlington
1886 †Wilson, Sir Jacob, Chillingham Barns, Belford
1886 Wilson, John, The Leazes Park, Newcastle-on-Tyne
1894 Wilson, Henry, Architect, Hexham
1901 Wilson, John, Harton, South Shields.
1902 Wilson, Joseph, Timber Merchant, Pelaw Grange Saw Mills, Birtley, R.S.O., Co. Durham
1902 Wilton, J. P.
1902 Winch, W. F., Land Agent, Cranbrook, Kent
1897 Winder, James, Gardener, Howden Dene, Corbridge
1899 Winter, Thomas Scott, Builder and Surveyor, Mile End Road, South Shields. (Since resigned.)
1898 Wiseman, Edward, Nurseryman, Elgin
1894 *Wood, A. F. N., Belswardyne Hall, Shrewsbury
1898 Wood, George, Brandon, Suffolk
1900 Wood, John, Estate Office, Brandsby, Easingwold

Date of Election

1901 Wood, Leslie S., F.S.I., High Street, East Grinstead
1902 Wood, H. C., P.A.S.I., Land Agent, Chester's Estate Office, Humshaugh R.S.O., Northumberland
1902 Wood, Waid A.
1903 Wood, W. J., Cabinet Manufacturer, 66, 68 and 70 Cuthbert Street, South Shields
1904 Woodcock, R. Frank, Land Agent, Haslemere
1903 *Woodruffe-Peacock, Rev. E. Adrian, Cadney Vicarage, Brigg
1902 Wright, A. Ireland, Carlton House, Newcastle-on-Tyne
1904 Wright, N. J., Timber Merchant, Morpeth
1902 Wylam, Ralph J., Assistant Estate Sawyer, Chester Lodge, Lambton Park, via Chester-le-Street
1904 Yorke, Maurice, 35 New Walk, Leicester
1893 Young, T. J., South Eastern Agricultural College, Wye, near Ashford, Kent
1896 Young, Harry J., 32 Esplanade, Whitley Bay
1896 Young, Dr., Whitley Bay
1902 Young, Henry B., Blanking Estate Office, Metheringham, Lincoln
1902 Young, F. E., Land Agent, Londesborough, Market Weighton, Yorks.

Patrons.

The Right Hon. the Earl of Durham, Lambton Castle, Durham
The Right Hon. the Earl of Carlisle, Naworth Castle, Brampton
The Right Hon. Lord Avebury, High Elms, Hayes, Kent
Thomas Taylor, Esq., Chipchase Castle, North Tyne
The Right Hon. the Earl of Crewe, Crewe Hall, Crewe, Cheshire
The Right Hon. Lord Masham, Swinton, Masham
Sir Jacob Wilson, Chillingham Barns, Belford
John Maughan, Esq,, P.A.S.I., Jervaulx, Middleham
F. W. Beadon, Esq., Longley Hall, Huddersfield
Mr. Coroner Graham, Findon Cottage, Sacriston, Durham
Dr. Somerville, The Board of Agriculture, Whitehall, S.W.
George Marshall, Esq., Godalming, Surrey.

President.

Professor W. R. Fisher, Coopers Hill, Englefield Green

Vice-Presidents.

W. B. Havelock, The Nurseries, Brocklesby
J. H. Straker, Howden Dene, Corbridge
C. G. Grey, Ballycourcy, Enniscorthy
A. T. Gillanders, Alnwick Castle, Alnwick
John Scott, Newton, Stocksfield
William Milne, Hexham
J. W. Robson, Hexham
William Forbes, Woodhouse Lane, Leeds
M. Daubré, Directeur des Eaux et Forêts, Paris. (Honorary.)
W. D. Cruddas, Haughton Castle, Northumberland
Bernard Cowan, F.R.H.S., South Shields
Joseph S. Gray, Mill View, Holgate, York
George Gallie, Sledmere, York

Members of Council.

John Wilson, Leazes Park, Newcastle
Principal J. Smith Hill, B.A., Agricultural College, Aspatria
D. C. Legard, Heighington, Lincoln
W. A. Forster, Belgrave Lodge, Pulford, Wrexham
Thomas Roberts, Easebourne, Midhurst
George Cooper, Gateshead
A. C. Forbes, Durham College of Science, Newcastle
J. P. Robertson, Chatsworth, Derbys.
H. J. Elwes, Colesborne, Cheltenham
Sir Hugh Beevor, Bart., Croxley Green
A. J. Forrest, Thorney, Peterborough
Edward Shipley, 20 North Road, Darlington
W. A. Herd, Nurseryman, Penrith
Wm. Elder, Cholmondeley, near Malpas
Chas. Hankins, Wordwell, Culford, Bury St. Edmunds
George Ross, The Nurseries, Hexham
T. Bewick, Raby Estate Office, Staindrop, Darlington
Leslie S. Wood, College View, East Grinstead
Professor Potter, Durham College of Science, Newcastle
D. Hamilton, Knowsley, Prescot
T. W. Luke, Bridge End, Warden, Hexham

Secretary and Treasurer.

John Davidson, Estate Office, Haydon Bridge, Northumberland

Assistant Secretary.

Edward Davidson, Estate Office, Haydon Bridge, Northumberland

Auditors.

Bernard Cowan, Westoe, South Shields
Alderman Clough, Gateshead

Local Secretaries

W. B. Havelock, Brocklesby, Lincolnshire
William Forbes, Woodhouse Lane, Leeds
Bernard Cowan, Westoe, South Shields
William Fleming, Tudhoe, Durham
James Barrie, Torrington, North Devon
Francis Mitchell, Woburn, Bedford
Edward Shipley, 20 North Road, Darlington
Frank Hull, Lillieshall, Newport
W. A. Forster, Belgrave Lodge, Pulford
W. Tomlinson, Clumber, Worksop
A. J. Forrest, Thorney
William Elder, Cholmondeley, near Malpas
Thomas Roberts, Midhurst, Surrey
Edward Davidson, Estate Office, Haydon Bridge
Robert Coupar, Ashford, Co. Galway
W. Storie, Highclere, Newbury
John Mitchell, Strid Cottage, Bolton Abbey
Charles Hankins, Bury St. Edmunds
D. A. Glen, Bedgebury Park, Goudhurst
A. T. Gillanders, Alnwick Castle, Alnwick
George Clark, Haltwhistle
Thomas Lewis, Fair Oak House, Roath Park, Cardiff
Capt. Davidson, Harrogate
D. C. Legard, Lincoln

Judges.

John Maughan, P.A.S.I., Jervaulx
Joseph S. Gray, Holgate, York
A. C. Forbes, Durham College of Science, Newcastle

Forestry Examiners.

William Forbes, Woodhouse Lane, Leeds
W. B. Havelock, Brocklesby
Principal J. Smith Hill, B.A., Aspatria

The Royal English Arboricultural Society.

TWENTY-FOURTH ANNUAL MEETING.

The Twenty-fourth Annual General Meeting, and the first since His Majesty the King was graciously pleased to confer the prefix "Royal" to the name of the Society, was held at the Liverpool Street Hotel, in the City of London, on Saturday, the 12th of August, 1905.

The President (Professor Fisher) took the chair, and was supported by the following members, who also joined in the tour through the Belgian Forests.

Sir Hugh Beevor, Bart., Wimpole Street, W.; Messrs. T. Henry Atkinson, Eilan's Gate, Hexham; James T. Atkin, Salisbury House, South Shields; Walter Beeson and Cyril F. C. Beeson, 1 St. John's Road, Oxford; J. Bowker, Cemetery Superintendent, Darlington; W. T. Bodger, 10 Urfa Terrace, South Shields; G. B. Bell, South Shields; H. Bulman, South Shields; E. J. Brown, 16 Bigby Street, Brigg; A. Currie, 48 Jesmond Road, Newcastle; Geo. Cooper, Cemetery Superintendent, Gateshead; James Crooks and Fred Crooks, Eccleston Park, Prescot; B. Cowan, Cemetery Superintendent, South Shields; W. Clough, Low Fell, Gateshead; Cyril H. Donne, The Abbey Ruins, Bury St. Edmunds; Edward Davidson (Assistant Secretary), Haydon Bridge; Wm. Davidson, Kent Road, Harrogate; W. Elder, Cholmondeley, Malpas; John Ferguson, Jesmond, Newcastle; A. C. Forbes, Armstrong College,

Newcastle; A. T. Gillanders, Park Cottage, Alnwick; William Graham, Wood Merchant, Alnwick: Thomas Glover, Delamere Villa, Lathom; Francis Glover, Three Oaks, Lathom; John Graham, Sacriston, Durham; J. Gilbert and A. Gilbert, Treval, near Torpoint R.S.O.; L. W. Gullachsen and L. H. Gullachsen, 10 Pilgrim Street, Newcastle; Charles Hankins, Wordwell Hall, Bury St. Edmunds; Principal J. Smith Hill, The Agricultural College, Aspatria: W. B. Havelock, Brocklesby Park, Lincolnshire; E. H. Lincoln, Cleadon, Sunderland: John Learmont, Larchfield, Dumfries: Percy O. Laidlow, Stonecroft, Fourstones; A. Langdale, Forest Hall, Newcastle: D. Laws, 10 East View, South Shields; Geo. Marshall, Frimstone, Liphook: Charles Miles, Stamford; P. Marshall, Euston, Thetford; S. Margerison, Calverley, near Leeds: J. Milthorpe, The Gowlands, Newcastle; A. Mitford, 5 Ocean Road, South Shields; Percival T. Maw, Holmesdale, Nutfield: E. Mc.Arthur Moir, 46 Melville Street, Edinburgh; F. H. Osmond-Smith, North Street, Midhurst: D. Petrie, Westoe, South Shields; Robert Robson, 42 Northumberland Street, Newcastle; L. J. C. Riley, Putley Court, Ledbury; G. C. Smyth Richards, Filleigh Lodge, South Molton; D. N. Royce, Oakham; Charles Richardson, Stamford; Fraser Storey, University College, Bangor; W. W. R. Sewell, Brandlingill, Cockermouth; Stephen Sheriff, Simonside House, Tyne Dock: Dr. Stewart, Hexham; J. M. Smith, 16 King Street, South Shields: John Taylor, Lansdowne House, Westoe; N. Temperley, 4 Carlton Terrace, Low Fell, Gateshead: N. I. Wright, Morpeth; Leslie Wood, East Grinstead: T. G. Whitmore, Bury St. Edmunds; J. W. Watt and A. P. Watt, Carlisle; R. Frank Woodcock, Haslemere: W. J. Wood, South Shields: J. Robinson, Hexham.

Members who attended the Annual Meeting only were as follows:—

A. Cameron, Longleat Nurseries, Warminster: John Davidson, Haydon Bridge (Secretary and Treasurer): H. J. Elwes, Colesborne, Cheltenham; J. S. Gamble, East Liss; W. A. Herd, Penrith; John Kennedy, Millgreen Cottage, Ingatestone; Dr. Somerville, Board of Agriculture: Edwin Skewiss, Brendon, Tonbridge; W. V. K. Stenning, Halsford, East Grinstead; Thomas Roberts, Easeborne.

Minutes.

The Assistant Secretary (Mr. Edward Davidson) read the minutes of the previous meetings, which were approved.

The President, who was cordially greeted on rising to speak, said, I was extremely sorry not to be present last year when you elected me President, I had been in France, with my students and also with the Scottish Society, and I was unable to join you. I wish now to thank you for the honour you did me in electing me your President. I wish also to congratulate the Society on being now called the Royal English Arboricultural Society. I think we have to thank our Secretary for that, the arrangements were made by him, and it is due to his exertions that the honour was conferred upon the Society. (Cheers.)

Election of Members.

Mr. Edward Davidson then read the following list of new members and candidates :—

Elected at Council Meeting, held at York, on Tuesday, 27th September, 1904.

Boston, Richard, Hallgarth House, Carthorpe, Bedale.
Knollys, C. R., Grange Estate Office, Alresford, Hants.
Learmont, John, Larchfield Nurseries, Dumfries.
Newnham, J. H., 11 Leighton Road, West Ealing, W.
Shaw, Wm. T., Horris Bank, Newton, Newbury.
Wilkinson, C. J., Sebergham Castle, Dalston, Cumberland.

Elected at Council Meeting, held at York, on Wednesday, 1st March, 1905.

Ashdown, A. H., Uppington, Wellington, Salop.
Ackers, B. St. John, Huntley Manor, Gloucester.
Ackers, Chas. P., Huntley Manor, Gloucester.
Annet, Thos., c/o Mr. A Payne, Bower Ashton, nr. Bristol.
Berney, A. H., Damerham, Salisbury.

Bennet, John, Towns End, Wolverton, Basingstoke, Hants.
Bodger, W. T., 10 Urfa Terrace, South Shields.
Dimsdale, Robt., Ravenshill, Leachlade, Glos.
Dingwall, R., 6 Neville Street, Newcastle-on-Tyne.
Ellison, Edward, Rathdrum, Co. Wicklow.
Hanson, C. O., Staunton, Coleford, Glos.
Hedefine, Edward, Castletown House, St. Aidan's Road, South Shields.
Jones, Walter, Leachlade Manor, Glos.
Mc.Dowell, John, 58 Julian Avenue, South Shields.
Mounsey, H., c/o John Johnston, 2 Graham Street, Longtown.
Macdonald, D. M., c/o Mr. A. T. Gillanders, Park Cottage, Alnwick.
Mitford, A., 5 Ocean Road, South Shields.
Petch, John S., Wensley, Leyburn, Yorks.
Parker, F. W., 11 Regent Street, London, S.W.
Pennick & Co., Delgany Nurseries, Co. Wicklow.
Richards, G. C. Smyth, Castle Hill, nr. South Molton.
Slater, A., junr., Ivy Dene House, Arnesbury, near Salisbury.
Skelley, Sir John C. E., Bart., Avington, Alresford, Hants.
Thompson, Thos. E., Jervaulx Abbey, Middleham, R.S.O.
Thynne, Col. A., 50 Cadogan Square, London.
Tully, Robt., 9 The Lawe, South Shields.
Ware, J. G. Wyndham, Eaton Hastings, Faringdon, Berks.
Wright, A., The Gardens, Eshott Hall, Felton, R.S.O.
Walker, Sir Francis E., Bart., Alnwick.

Elected on Saturday, the 12th August, 1905, at the Annual General Meeting in London.

Adkin, B. W., 14 Queen Street, Cheapside, E.C.
Argent, Thos., Buscot Park, Faringdon, Berks.
Brunton, J., Pilsley, Bakewell, Derbyshire.
Barker, A., Shanbally, Cloghen, Cahir, Co. Tipperary.
Brown, E., 16 Bigby Street, Brigg.
Beaver, R., Skipton.
Bowman, John, Timber Merchant, Newcastle-on-Tyne.
Briggs, A. C., Gledhow Grange, Leeds.

Chapman, H., Pilsley, Bakewell, Derbyshire.
Clark, J. S., Bothal, Morpeth.
Crooks, F., Woodlands, Eccleston Park, Prescot.
Crisp, F. A., Broadhurst, Godalming, Surrey.
Duff, Thos., Pilsley, Bakewell, Derbyshire.
Donne, C. H., The Abbey Ruins, Bury St. Edmunds.
Dashwood, A. H., Stibbington House, Wansford.
Duthie, J., Ramsdell, Basingstoke, Hants.
Evans, H., 55 Markham Avenue, Leeds.
Edmondson, Fletcher, Green Market, Newcastle.
Farago, Adalbert, Baumschule, Hungary.
Finn, M. R., Argyle Street, Hebburn.
Gilbert, A. C., Antony Estate Office, Treval, nr. Torpoint.
Harland, Geo., Commercial Buildings, 97 Hudson Street, Tyne Dock.
Irish, Charles, Crewkerne.
Johnson, Geo., Biningborough Estate, Skipton, Yorks.
Jackson, H. F., Park Hill, Rochdale.
Langdale, A. O., 2 Claremont Villas, Forest Hall, Newcastle.
Mc.Glashan, John, Pilsley, Bakewell, Derbyshire.
Norman, Robt., Ardgowan, Inverkip, Greenock, N.B.
Napier, H. W., Ashton Court Estate Office, Bristol.
Puttock, W. H., Billingshurst, Sussex.
Naylor, H., Driffield, Yorks.
Palfrey, H., Ampton Park, Bury St. Edmunds.
Robson, Joseph, Timber Merchant, Prudhoe-on-Tyne.
Remer, J. S., Derby Road, Canada Dock, Liverpool.
Rogers, C. G., Indian Forest Service, 54 Parliament Street, S.W.
Smithson, John, Timber Merchant, Prudhoe-on-Tyne.
Thring, D. T., Boughton House, nr. Kattering.
Terry, E., Great Finborough, Stowmarket.
Wellington, His Grace the Duke of, Ewhurst Park, Basingstoke.

The meeting unanimously confirmed the election of all the gentlemen named in the foregoing list.

Mr. Bernard Cowan moved, and Mr. Hankins seconded, the formal admission of the gentlemen therein named as members of the Society. This was carried unanimously.

Mr. Edward Davidson read a statement shewing that the total membership of the Society was now 756.

Total number of members at beginning of year			733
During the year there had been—			
Resignations and Lapses	43		
Deaths	8		
			51
			682
Elected at Council Meetings	35		
Elected at this Meeting	39		
			74
		Total	756

Financial Statement.

Mr. Edward Davidson read the Financial Statement.

RECEIPTS.

By balance brought forward—			
In Bank	£124 8 0		
Cash in hand	12 13 7		
		£137 1 7	
Subscriptions, Life Members	55 13 0		
Ordinary ,,	193 14 6		
		249 7 6	
Advertisements		13 5 0	
Bank Interest on Deposit		1 17 2	
		£401 11 3	

PAYMENTS.

Use of rooms for Council Meetings and Councillors' Railway Fares							
Sept., 1904	£15	12	9				
March, 1905	12	19	9				
				£28	12	6	
Medals - - - -					3		
Printing *Transactions*, including blocks, copyright of photos, and postage - - -				69	2	0	
Stationery and Sundry Printing -				16	9	6	
Postages, Telegrams, Railway Carriages, etc.				23	18	0	
Reporter's Fees and Expenses -				8	8	0	
Expenses in connection with the plants presented by the Honble. Mark Rolle - - -				5	19	0	
Secretary and Treasurer's Salary -				25	0	0	
Assistant Secretary's Salary -				15	10	0	
							£195 2 6
By Deposit in Bank - -				124	8	0	
By Cash in hand - - -				82	0	0	
							206 8 9
							£401 11 3

Mr. HANKINS proposed, and Mr. ROBERTS seconded the adoption of the accounts, and this was agreed to.

THE PRESIDENT, 1905-6.

Dr. SOMERVILLE: I have very great pleasure in proposing the re-election of Professor Fisher as our President for the ensuing year. He is only just getting into the saddle and it would be a pity to change as we have such a good man. (Hear, hear.)

Mr. COWAN seconded, and Mr. COOPER formally supported the proposition, which was carried with acclamation.

Professor Fisher: I am extremely obliged to you for the honour you have done me, and I will always do my best for the Society. I have been most ably supported by the Secretary in the vast amount of work which he has done during the year, and I have also to thank Sir Hugh Beevor and others for the way in which they have worked in regard to the subject of railway rates, and also Mr. Leslie Wood for his valuable report on the finances of the Society. The question of the improvement of the *Transactions* of the Society has been under consideration, and the Council have elected certain gentlemen whose names will carry weight as an editorial committee. There is Mr. Smith Hill, representing the educational side of the subject, and Mr. A. C. Forbes, who represents that side as well as the practical side of the work: Dr. A. Henry, who represents all sides of the subject, after having travelled far and wide (he has studied at the Nancy Forest School, and is now associated with Mr. Elwes in the preparation of a great work on forest trees, which is being brought forward). The Society, I am glad to say, is increasing in numbers and weight, and is spreading all over the United Kingdom. It had small beginnings in the North of England, but it has now gone the length and breadth of the land, and it is desirable that our *Transactions* should become more scientific. I thank you again for the honour you have done me, and I trust that we shall have a very successful year. (Cheers.)

The Vice-Presidents.

Mr. George Marshall proposed the re-election of Mr. W. B. Havelock, Brocklesby Park, as Vice-President, and the election of Principal J. Smith Hill, Aspatria, in place of Mr. J. H. Straker, Howden Dene, who did not seem to have much time to devote to the work of the Society.

Mr. Coroner Graham: I have the greatest possible pleasure in seconding the proposition, as I have always held that those who accept office in our Society should be men who are prepared to devote themselves to its service, and not men who are content to have their names on the list of officers, and with all respect to the gentleman who is going off, his place will be well filled by Mr. Smith Hill. (Hear, hear.) The proposition was carried.

The Council.

The retiring members of the Council, eligible for re-election, were as follows:—Mr. John Wilson, Leazes Park, Newcastle; Mr. D. C. Legard, Heighington Hill, Lincoln; Principal J. Smith Hill, Aspatria; Mr. W. A. Forster, Pulford; and Mr. Thomas Roberts, Easeborne.

Mr. Gillanders proposed the re-election of Mr. Forster and Mr. Roberts. This was agreed to.

Mr. A. C. Forbes proposed Mr. Fraser Story, and this was carried.

Dr. Somerville proposed Mr. Robert Anderson (Cirencester), and the meeting unanimously approved the proposition.

Mr. Marshall proposed the election of the Hon. Mark Rolle's forester, Mr. James Barrie, as a member in place of Mr. Smith Hill, who had been chosen as a Vice-President, and this was agreed to.

There being no other nominations, these gentlemen were declared duly elected as members of the Council.

The Secretary and Assistant Secretary.

Mr. Coroner Graham: With regard to the next business on the agenda, what can we do, Sir, better than to ask the present Secretary and Treasurer and his able son and assistant to be so good as to continue to favour the Society with their services. (Cheers.) Mr. John Davidson is the father of the Society, and Mr. Edward Davidson, who may almost be said to have grown with the Society, is an admirable organiser, as we have experienced over and over again, and I have the utmost pleasure in proposing the re-election of these two gentlemen, who have done so much for the Society. (Cheers.)

Mr. Smith (South Shields) formally seconded the proposition. which was carried with acclamation, the members saying "agreed."

Mr. John Davidson (who was warmly greeted): If you can keep a secret—I don't do much of the work. (Laughter.) The credit is due to the Assistant Secretary, who does the greater part of the work, and not to me. (Cheers.)

The Local Secretaries.

The Local Secretaries were re-elected, viz. :—Messrs. W. B. Havelock, Brocklesby ; William Forbes, 21 Union Terrace, York ; Bernard Cowan, Westoe, South Shields ; William Fleming, Tudhoe, Durham ; James Barrie, Torrington, North Devon ; Francis Mitchell, Woburn, Bedford ; Edward Shipley, 20 North Road, Darlington ; Frank Hull, Lillieshall, Newport ; W. A. Forster, Belgrave Lodge, Pulford ; W. Tomlinson, Clumber, Worksop ; A. J. Forrest, Thorney, Peterborough ; Wm. Elder, Cholmondeley, near Malpas ; Thomas Roberts, Midhurst, Surrey ; Edward Davidson, Haydon Bridge ; Robert Coupar, Ashford, co. Galway ; W. Storie, Highclere, Newbury ; John Mitchell, Strid Cottage, Bolton Abbey ; Chas. Hankins, Bury St. Edmunds ; D. A. Glen ; A. T. Gillanders, Park Cottage, Alnwick ; George Clark, Haltwhistle ; Thomas Lewis, Fair Oak House, Roath Park, Cardiff; Captain Davidson, Harrogate ; and D. C. Legard, Lincoln.

Judges of Essays.

Messrs. Joseph S. Gray ; John Maughan, Jervaulx ; and A. C. Forbes were re appointed Judges of Essays for the coming year.

Forestry Examiners.

The forestry examiners were re-appointed as follows :—Messrs. Forbes, W. B. Havelock, and Principal J. Smith Hill.

The Auditors.

The Hon. Auditors, Alderman Clough and Mr. Bernard Cowan, were unanimously re-elected, and cordially thanked for their services to the Society.

The Essays. Judges' Report.

The Assistant Secretary read the Judges' Report on the Essays, as follows :—

Dr. A. W. Borthwick. Royal Botanic Gardens, Edinburgh, *Gold Medal*, for essay on "The Life History of the Scots Fir."

Mr. Wm. Forbes, 21 Union Terrace, York, *Gold Medal*, for essay on "The suitability of the different kinds of Douglas Fir

for commercial purposes in pure or mixed woods for cultivation in different soils and localities in the British Isles."

Mr. Wm. Forbes, 21 Union Terrace, York, *Silver Medal*, for essay on "The best method of raising trees from seed in the Home Nursery."

Mr. Wm. Forbes, 21 Union Terrace, York, *Silver Medal*, for essay on "Fox Covers."

Mr. David Mc.Beath, Abbey Village, Withnell, Chorley, Lancashire, *Silver Medal*, for essay on "The Disposal of Forest Produce."

Mr. C. S. Orwin, S.E. Agricultural College, Wye, Kent, *Silver Medal*, for essay on "The Bavarian Oak Forests."

Mr. A. C. Forbes said that the essay by "Tracheid" was really a monograph on the subject, and it would not be doing justice to the writer to publish it without all the illustrations which were necessary to accompany it. Perhaps the Society will see the advisability of publishing the essay as a separate thing altogether. It is really too good for our *Transactions*.

Mr. Elwes: Nothing can be too good for our *Transactions* and I think that we ought to print it. (Hear, hear.)

Mr. Forbes: But it is really a monograph.

Mr. Elwes: The difference between an essay and a monograph is immaterial.

Mr. Forbes: I think it would be well to print it as a pamphlet and sell it separately.

Members: No, no.

Mr. Forbes: I should like to add that one of the judges refused to make an award because he recognised the handwriting of the competitor, and it was suggested that the essays should in future be typewritten. On the whole, the essays had never been of a higher level of merit. (Hear, hear.)

Mr. Elwes: Surely if we appoint judges we should trust them, whether the essays are typewritten or not. (Hear, hear.)

Mr. GILLANDERS: I hope the Committee will see their way to publish the essay by "Tracheid," whatever the expense of the illustrations. (Hear, hear.)

THE FINANCES.

Mr. LESLIE WOOD said that hitherto the accounts had simply stated the amount of money in hand, and had taken no notice of whether the money came from ordinary or from life-members. A sub-committee was accordingly appointed to consider the whole question of the finances of the Society. Their report was as follows:—

1. That £100 of the sum at present on deposit at the bank be invested in securities to form the nucleus of a capital account, and that additions be made to this sum when the balance on the revenue account justifies it.

2. That in the future statements of accounts, the capital account shall show the value of the investments and the liability of the Society to its life members.

3. That in other respects the accounts of the Society shall be kept as at present, and the interest on the funds invested shall be paid to the revenue account. At the same time, when the capital of the Society is sufficient to meet the liabilities to the life members, a reconstruction of the system of accounts will be possible and advisable.

4. That in defining the liability of the Society to its life members, this shall be taken at the sum of £233 in August, 1904. This amount has been fixed by assuming the average age on admittance to be forty-five, with an expectation of life of twenty-four years, working on the 4 per cent. table. The life membership in August, 1904, was: sixty-four five-guinea members, and three three-guinea members, with an average term of membership of eight years.

5. To find the liability in succeeding years, the sums received for life subscriptions shall be added to the capital sum of the previous year and the following deductions shall be made:— For each £5 5s. member, 7s. per annum; for each £3 3s. member, 4s. per annum; and for each £2 2s. member, 3s. per annum.

6. That in future, new members shall pay an entrance fee equal to the amount of the annual subscription.

7. That an additional sum shall be included in the amount payable by each member attending the annual summer meeting, to cover the sundry expenses which are now annually charged against the Society.

Mr. Wood: I hope that in the next two or three years we shall be in a position to wipe out the deficit caused by our liabilities to the life members. Certain alterations of the rules may be necessary, and they will have to come up in proper form for the consideration of the Society.

Mr. Stenning: I propose the acceptance of the recommendations of the sub-committee.

A member expressed a wish to hear the views of the Council on the matter.

Mr. Cowan: As there is so much business to get through, perhaps it would be better to leave it to the Council to consider and report.

Mr. Roberts said that he would second such a motion.

Mr. Stenning: It would be better to adopt the report at once.

Mr. Cowan: We can adopt them subject to the report of the Council.

This proposition was carried.

Railway Rates on Timber.

Sir Hugh Beevor produced the interim report of the Special Committee for Railway Rates on British Timber, as follows:—

Your Committee has held several Meetings, and views this question as one of the greatest possible importance to members of the Royal English Arboricultural Society, to landowners, and agricultural working men of this country. There is no doubt that these last have suffered more particularly on account of the differential rates given by the railway companies for foreign as compared with English timber, and owing to the fact that any bar to economic forestry withdraws from the labourer's highly valued opportunity of earning good wages in winter.

A study of the following ordinary comparisons will speak for itself. Any selection is merely to represent different railway companies.

	January, 1905. Distance.	Foreign Wood in Plank.	English Timber in the Round.
A	47 miles	7s.	13s. 7d. 144 divisor
B	40 ,,	7s.	11s. (40 or 50 ft. to ton.)
C	17 ,,	4s. 8d.	7s. 6d.
D	116 ,,	19s. 3d.	29s. 4d.
E	133 ,,	17s. 11d.	24s. 4d.
F	60 ,,	16s. 8d.	27s. 8d.
G	44 ,,	8s. 7d.	13s. 1d.
H	105 ,,	12s. 1d.	20s. 6d.
J	48 ,,	8s. 8d.	14s. 2d.
K	147 ,,	17s. 5d.	25s. 2d.
L	95 ,,	11s. 8d.	19s. 2d.
M	194 ,,	15s. 9d.	26s. 0d.
N	63 ,,	8s. 9d.	13s. 2d.
O	107 ,,	12s. 3d.	20s. 0d.
P	144 ,,	16s. 11d.	26s. 0d.
Q	113 ,,	14s. 0d.	21s. 5d.
R	20 ,,	5s. 6d.	7s. 8d.
S	201 ,,	17s. 6d.	27s. 6d.
T	195 ,,		
U	63 ,,		
V	66 ,,	8s. 9d.	14s. 4d.
W	64 ,,	9s. 7d.	14s. 4d.

X Hull to Birmingham, foreign Odessa round ash 18s. 4d. per ton, including delivery in Birmingham, against Birmingham to Hull. English round ash, 23s. 6d. per ton station to station. As the cartage costs 3s. 6d. per ton, this makes an actual difference in favour of foreign timber of 8s. 8d. per ton.

In addition to the foregoing, Mr. Robt. Anderson (Cirencester) pointed out in a letter to the *Times* in September, 1904, further cases as follows:—

Pitwood. Caerleon to Great Barr (English) in Staffordshire 15s. per ton, a less distance than the Port of Cardiff to the same place (foreign) which is quoted at 11s. 10d.

Cleeve to Great Barr (English) 11s. 6d., while from the Port of Gloucester, 13 miles further on and on the same line of railway (foreign) 9s. 1d. per ton.

Telegraph poles, etc.—Hartlepool to Cheltenham, 21s. 5d.

For round timber—Hartlepool to Cheltenham, 33s. 3d.

In addition, Mr. Anderson points out as follows:—"An acre of fir plantation cut for pitwood at forty years' growth, averaging 80 tons . . . . foreign stuff can be delivered for £47 6s. 8d., while home-grown wood, grown nearer the pits, and apparently on the same route, is charged £60—a difference in favour of the foreign producer of £12 13s. 4d. per acre on the rail expenses only."

Innumerable cases of the same nature could be recited. Mr. Sutton Remer, in a letter to the *Timber Trades Journal*, published May 20th, says that "the action of the railway companies is slowly but surely killing the English timber trade." The effect of all this is to dishearten the English timber merchant. It causes him to despair of effecting any satisfactory business, or of obtaining from the supplying landlord those extra charges which he has to pay the railway company; the result being that difficulties crop up between the grower and the purchaser, and supplies become more and more uncertain; an advantage in favour of foreign timber where the supplies can regularly be reckoned upon. That trade, where English timber was recently used, in poles, pit props, fencing timber, wheelwright's supplies, carriage building timber, wagon building timber and railway requirements, etc., is steadily but surely developing in the direction of supplies of foreign timber, to the disadvantage of the home-grown products, and this is mainly due to the prohibitive railway charges. We believe that the companies themselves might derive a steady and considerable income from the traffic in English timber if they used the same good judgment and energy they now display in their efforts to maintain their foreign traffic. We have carefully considered the question of convenience of the companies, and we have come to the conclusion that the handling of foreign timber need not be any less expensive than English timber, as in the first case, in most circumstances, each piece of converted timber has to be loaded and discharged from the truck separately, whilst English timber in the round can be loaded in one or two lifts from the

crane, and on this ground we do not think there is any cause for any higher rate to be demanded. Your Committee notices with pleasure the renewed interest which has lately been taken in the question of reafforestation of the country as shown by the paper read by Sir Herbert Maxwell at the Society of Arts, and by other efforts recently made to bring this subject before the notice of the public. It must, however, be remembered that no great advance can be made until the subject of railway rates has been considered and reformed. In a letter published in the *Timber Trades Journal*, dated July 1st, Mr. A. L. Howard has pointed out that "foreign timber can be brought 500 miles from the interior of a continent, and 3,000 odd hundred miles across the ocean, at the same rate that it now costs to carry 140 miles in this country; and, whilst this condition prevails, those who produce timber at home can hardly expect much encouragement in their efforts." In conclusion, your Committee has carefully considered the best method to be adopted by the Royal English Arboricultural Society to deal with this matter, and it has been decided that no special effort can be made in the direction of approaching the companies themselves. Whilst your Committee will use every effort to bring about an improvement in the state of affairs, for the present it is proposed to take every opportunity, publicly and privately, to ventilate the subject, so that general attention may be paid to it, and that all landowners and others interested will realise the true position.

1. To this end your Committee recommends that this Committee be appointed for the ensuing year.

2. That this interim report be published in the next number of the Society's *Transactions*, and previously communicated to all members of the Royal English Arboricultural Society.

3. That copies of this report be provided for the use of local secretaries, or chosen members of the Society, for forwarding to every English owner of 200 acres of wood and upwards, in such a way as may best lead to its consideration.

(Signed) W. R. Fisher, Chairman.

Sir Hugh Beevor said that the report was one of the greatest possible importance and he would have been glad if all the members could have had an opportunity of reading it beforehand.

Doubtless, railway rates are a grievance to all who are connected with the trade, either as growers or as merchants; at the same time, they must not forget the fact that the railway companies are among our best customers. He moved that the report be entered on the minutes.

Mr. Elwes: Nobody can question that this report is one of the most important things that the Society has ever undertaken. Unfortunately, time did not permit of its being adequately discussed this evening. I hope the members of the Society will see that that matter is not dropped. Here is a report which proves that the effect of railway rates is perhaps greater than that of everything else put together, and that railway rates were simply killing the English timber trade.

Mr. Margerison: The difference between the rates on foreign and English timber amounts practically to a rental equivalent to five shillings per acre per annum of the woodlands of the country, and taking them generally they were not worth much more than that. The Society should consider how it could co-operate with the members of the timber trade who were a little bit weary of fighting the railway companies alone on a question which they thought was just as much a concern of the owners of woods and forests. (Hear, hear).

Mr. Elwes: Perhaps a deputation to the proper authorities would be the best method of raising the question. There are innumerable precedents for such a course, and the Society will be losing a great opportunity if it shelves this report.

Dr. Somerville: I am very glad that the question has been raised by Mr. Elwes, as there is at the present time an important Departmental Committee presided over by the Earl of Jersey to inquire into the question of railway rates. I feel sure that the Committee would welcome the evidence of representatives of the Royal English Arboricultural Society as to the alleged preference of foreign over English timber. If the Society approved, the Chairman of its special committee on railway rates could attend before the Departmental Committee and present the evidence, and it would do a great deal of good.

The Report having been formally received,

Sir Hugh Beevor moved that a copy of the Report be sent to the Departmental Committee, and that one of the members be selected to give evidence before the Committee.

Mr. Coroner Graham formally seconded the proposition, which was carried.

Mr. Stenning: When the Railway Rates Committee of the London Chamber of Commerce approached the Departmental Committee, they were refused a hearing, and I am therefore very glad to hear the words which have fallen from Professor Somerville. I trust that if the Society tenders evidence it will receive due weight, in the interests alike of forestry and the timber trade.

It was unanimously resolved:—

1.—That the Committee be re-appointed for the ensuing year.

2.—That the Interim Report be published in the next number of the Society's *Transactions*, and previously communicated to all members of the Royal English Arboricultural Society.

3.—That copies of this Report be provided for the use of Local Secretaries or chosen Members of the Society for forwarding to every English owner of 200 acres of wood and upwards, in such a way as may best lead to its consideration.

Revision of the Rules.

Dr. Somerville: We are met to-day under very exceptional circumstances. We have, as it were, received a fresh Charter for a larger sphere of work in the future, and we have got to act up to our higher destinies, and although I am not one of the kind of men who cares very much whether a person speaks of arboriculture or of sylviculture, still there are certain alterations which are desirable in our rules, and I have accordingly to propose the amendments which are set down in my name. One of the functions of the Society is the dissemination of information about forestry matters and a great deal of advisory work of that kind has hitherto fallen upon our Secretary. I do not think that the Society gains in dignity by keeping a sort of black list of those who from one cause or another get in arrear with their subscriptions, and some of whom might at the first opportunity resume their

membership. With regard to the last of my proposals, I think, in view of the great increase in the number of members, the number of those who might convene an Extraordinary General Meeting ought to be raised from 12 to 50.

He moved the following amendments:—

Page 1, Rule II.—The word "Forestry" to be included. The word "Sylvicultural" to be substituted for "Botanical." The word "Rural" to be substituted for "constructive."

Rule III. to read—"By the formation of a Museum of Specimens of British and Foreign Woods, and other articles of forest produce, and of forest Insects, Diseases, Plans, Implements, Models, etc., as well as a Library for general consultation and reference."

Additional Clause to follow Clause III.—"By holding examinations in the science and practice of Forestry, and by granting Certificates to such candidates as shall show a sufficient degree of merit."

Additional Clause to follow Clause IV.—"By disseminating information with regard to all subjects connected with the growth of trees, and with the sylvicultural utilization of land."

Rule VI.—The words "and an annual list of those parties struck off the roll of members from this cause shall be submitted and read by the Treasurer to the General Meeting in each year" to be omitted.

Rule VIII. to read—"Who have acquired eminence in Forestry or Arboriculture, etc."

Rule XIV.—The word "fifty" to be substituted for "twelve."

The PRESIDENT thought that the best course would be for the members to discuss the various propositions, and then for the Secretary to circulate the amended rules to all the members of the Society, and for the Council to consider them.

Mr. ELWES: The rules have been before the members for nearly a month, and that is surely long enough. I propose that the amendments moved by Dr. Somerville be considered at once.

Mr. Marshall: I support that. Nothing could be more clearly put forward. We only meet once a year, and there is nothing in what Dr. Somerville has proposed that anyone could take exception to.

Mr. Bowker: I also think that the question has been before the members long enough.

The amendments proposed by Dr. Somerville were then put and carried.

Sir Hugh Beevor moved: "That the second portion of Rule III read (2) Foresters and Gardeners paying an annual subscription of Five Shillings."

Mr. Martin suggested that in accordance with a resolution which was passed some time ago by the Society, the word "schoolmasters" be added to the clause. This was agreed to, and the clause was adopted.

Mr. Gillanders moved: "That after this date the Council be empowered to elect all new members, and that candidates for membership shall not be eligible for election unless they be associated with arboriculture, either in its practical, commercial, or educational aspects." He said: In bringing forward this motion I trust that every member present will realise that it is not retrospective, and therefore remain undisturbed. I hope, also, that you will observe I am proposing to re-arrange the method of electing candidates on broad and comprehensive lines, and I have no sympathy whatever with a society of this character being composed from a few select classes. I can also quite understand that the motive of the originators and early members was a general one—to arouse a general interest. But having regard to the rapid development of the Society—a development exceeding the most sanguine anticipations—I think the time has now come, more especially with the prefix "Royal," when prestige must be maintained, and a broad qualification must be one of our main essentials. With regard to the *practical* side of the question, even the term landlord, as far as arboriculture is concerned, is now no longer limited to the owner of the soil. They must now reckon in their ranks town councillors, who had to deal with the planting

of catchment areas. All honour, therefore, to men like Mr. Cooper, who had proposed candidates with this object in view. On the practical side of the question they must not only embrace the estate agent, forester and gardener, but the superintendent of parks and large cemeteries, the professional landscape gardener, and so on. The *commercial* aspect of the question must of necessity be a broad one, inasmuch as it would embrace everyone connected with the sale and manufacture of trees living or dead. They must, of course, specially remember nurserymen, timber merchants, and many others too numerous to enumerate. *Educational.*—Since the formation of the Society, the educational aspect was practically a new feature—as evidenced by the formation of Agricultural Colleges, Lecturers on Forestry, and all other teachers connected with kindred sciences. We must embrace all teachers who are even indirectly associated with arboriculture, for by attending the meetings, etc., they would better understand the objects, and direct their teaching accordingly. Under the educational aspect we must also remember the school teacher, who had to deal with nature studies, and you cannot get much of nature without the trees, which beautify the landscape; they must not forget men of special scientific eminence, or men of special predilections associated with the side issues of natural history. With regard to the proposed method, I am quite well aware that some will be inclined to object to giving the Council full power to elect the members, but two reasons may be advanced in support of this proposal; firstly, because it was done, and had to be done, by the Royal Scottish Arboricultural Society; and secondly, because it gave an opportunity for more careful selection. It is wrong, in my opinion, to propose and elect members, and honorary members, on the spur of the moment, without a moment's warning, and with only perhaps one quarter of the members listening. Hence, I maintain, the Council should be considered responsible for the prestige of the Society. In summoning up the objects and methods of the proposal, I trust the meeting will see that the practical, commercial and educational aspects are sufficiently broad to embrace all that the Society wants, and "as no man can live unto himself," they must act so that the various sections can be welded together, making one solid whole, improving every zealous member, and benefiting the

arboriculture of the nation. On the other hand, without any qualifications, we are not true to our own objects, nor to the owners of property whose estates we visit, and whose hospitality we gratefully receive. I have always refused to bring forward gentlemen who might look upon these meetings as occasions for picnic parties, and I think it is time there was more discrimination used in regard to the election of members to the Society. (Hear, hear.)

Mr. Martin formally seconded the proposition.

Mr. John Davidson (Sec.): As one, probably the only one present who was at the inception of the Society. I am bound to state that many gentlemen who have been very good friends of the Society would have been excluded if the rule had been anything like that which has now been suggested by Mr. Gillanders. Times have changed, and at the time that the Society was founded it was very difficult to get anyone to take an interest in forestry, now it is different; still, I am strongly in favour of having it fairly open. (Hear, hear.)

Mr. Fraser Story: I am in favour of the motion, and I think that it will enable the Council to reject undesirable nominations.

Mr. A. C. Forbes: Would the views of the mover be met by the formation of a purely professional section of the Society? I do not know that it could be arranged immediately; but if it were practicable it would enable a man, a practical forester, to feel at home at once, instead of as at present. Such a course would enable the Society to receive both the practical forester and the class to which Mr. Davidson had referred, those whose support was beneficial to the Society. (Hear, hear.)

Sir Hugh Beevor: I think that the Council might have the power of veto on undesirable nominations.

Mr. Cowan: It would be putting too much power in the hands of the Council. I have seen the time when there were only four, five or six members present, but as soon as I brought forward a motion that they should be paid their expenses, of course the attendance increased. (Hear, hear and laughter.) I do not see how anyone who keeps a tree can be kept out of the Society if he wishes to join. There are thousands of pounds spent annually

through the working of the Society, and by the admission of the members of Municipal Corporations to our Society, and their being at our Annual Meetings, they have gone home fired with enthusiasm for tree-planting. I shall oppose the motion. (Hear, hear.)

Mr. J. M. Smith (South Shields): I am not one of those who have joined the Society for the outings, but because of an interest in arboriculture, and a belief, rightly or wrongly, that the Society might help it on. I have, for example, been for years an ardent advocate of tree planting in cemeteries. (Hear, hear.) I hope the Society will prosper; but I would have you all remember that its initial success was largely attributable to the support that it was freely and generously accorded by men who were not practical foresters. (Cheers.)

Mr. Havelock: I recognise the truth of a great deal that has been said, and I believe that Mr. Gillanders means well, but I should support an adjournment of the discussion on the matter, *sine die*.

Mr. Gillanders thereupon withdrew the motion, and the general question of the revision of the rules was left to the Council to deal with.

The remainder of the motions on the agenda in reference to the rules were closured, in effect, by the approach of the hands of the clock to the hour of seven, when dinner was served.

Mr. Elwes and Mr. Havelock informally agreed to combine the two propositions which stood on the paper in their respective names, and the resultant clause was passed, viz.:—

"That only one friend shall be allowed instead of two."

Bye-law XIII.—"The Council shall have power to allow, or otherwise, the attendance of ladies at the Summer Meeting."

The propositions as to the remaining rules were all referred to the Council, viz.:—

Mr. Bernard Cowan—

Rule III., Part I., should read—"That the Society shall

consist of two classes, Proprietors and Agents, Nurserymen, Florists, members of public bodies and others."

Rule X.—The trustees shall be John Graham, Esq., King's Coroner, Durham, and Alderman Clough, Gateshead.

Bye-law III.—To add, "or by ballot if two-thirds of the members present require it."

Bye-law XIII.—To add, "but shall have the privilege of going to any meeting, and visiting places of arboricultural interest as ordinary members for one year only."

The time and place of next year's meeting were left to the decision of the Council.

Mr. Cooper: I suggest Exeter.

Mr. Leslie Wood: We should welcome you to Sussex.

Mr. Elwes: There is not a better county from our point of view.

The proceedings then terminated.

The members dined together in the hotel.

The President proposed the health of His Majesty the King.

The members departed by the 8-40 p.m. express to Harwich, *en route* to Antwerp, Liège and Spa, etc.

Monsieur DUBOIS,
Directeur Général des Eaux et Forêts
en Belgique.

SUMMER MEETING IN BELGIUM.

August 12th to August 20th, 1905.

By J. Smith Hill, B.A., B.Sc., Revised by the President.

With an Introduction translated from an account of the Belgian Forests prepared for the Liège Exhibition.

INTRODUCTION.

In Belgium, woodlands belonging to the State, to Communes and public establishments were brought under public control by the Code Forestier, in 1854. This law allowed full liberty to the private owner of woodlands in the management of his property; but a Royal Ordinance of the 24th July, 1901, obliges private owners of woodlands to adopt special measures to prevent the invasion of certain destructive insects. This is the only Belgian regulation interfering with the liberty of the private owner, who is still permitted to destroy his forests.

Hence, speculation has too often caused the destruction of private woodlands, whilst the increasing demands for wood have greatly reduced the growing stock of timber on many private estates, which have been over-cut and badly treated.

It is now admitted in Belgium that forest conservancy, which is so important for the well-being of the country, must depend chiefly on State management. Since 1897, therefore, the State has been acquiring waste lands and planting them, £212,960 having been so invested up to date, and land to the extent of 15,317 acres having been planted.

Agricultural statistics of 1895 gave the following distribution of woodlands in Belgium according to the status of ownership :—

	Acres.
State Woodlands...	62,600
Communal Woodlands	395,455
Public Establishments' Woodlands ..	17,380
Private Woodlands	828,300
Total ...	1,303,735 acres

According to the cadastral survey of 1850, the area of Belgium is 7,363,765 acres (about twice the size of Yorkshire), so that the woodlands of the country comprise about one-sixth of the land. In 1850, there were the following areas of waste land :—

	Acres.
Private Ownership	423,322
Communal	145,267
State	17,140
Total ...	585,729 acres

Waste lands comprise alluvium deposited by the river Scheldt, the Fagnes of the Hertogenwald which were not planted with trees in 1850, heathlands attached to certain penitentiary establishments, and the military camps of Beverloo and Brasschaet.

The State has no power to compel Communes to plant their waste lands; but important subsidies are given by the State to encourage them to do so. The Forest Department also organises annual sylvicultural conferences, with the object of inducing Communes and private owners to plant their waste lands.

The Belgian Forest Department, besides managing State woodlands and those belonging to Communes and public establishments, exercises control over waste lands, game, and fisheries. There are eleven Inspectors' charges, each divided into three *cantonnements* under Sub-Inspectors, or *gardes généraux*. Each *cantonnement* is sub-divided into *brigades*, under *brigadiers forestiers*, and the brigades into *triages*, each under a forest guard.

In order to propagate correct ideas of forestry, there is a State service for experiments and consultations at the Central Adminis-

Fig. 1—A twice rooted Fir extracted by the "Lobo."

Fig. 2—The Reservoir of La Gileppe.

Fig. 3—The Barrage of La Gileppe Reservoir.

tration in Brussels, and State forest officials may be delegated to advise private owners on the management of their woods.

Since 1876, forest officers have been recruited from among certificated agricultural engineers. Up to 1893, this was done by selection, but since that year there is a public competitive examination for the post of forest officer, to which only agricultural engineers are admitted who have obtained diplomas in the Forestry Branch of the State Agricultural Institute at Gembloux, or at the Agronomic Institute of Louvain.

For the recruitment of forest-guards and brigadiers, courses in sylviculture reserved for retired soldiers only, are given at Bouillon and Diest, while travelling forestry instructors give lessons in forestry in all forest regions of Belgium, so that the forestry certificate is open to all; this certificate being required from all candidates for employment as forest-guard or brigadier.

Now that firewood and bark command only low prices, while timber is greatly in demand, the adoption of improved working-plans for woodlands is of considerable interest, and much attention is given to this matter by the State Forestry Department. A Commission is appointed to draw up improved working-plans for communal woods, consisting of the Director-General of Forests or his delegate, the local Inspector of Forests and the Garde General and a member of the Council of the Commune. The report of this Commission is laid before the Communal Council for approval, and this is almost always accorded.

Since 1885, 425 working-plans, extending over 310,000 acres of woodland, have thus been adopted.

Their chief object has been to increase the rotations of 83,500 acres of coppice-with-standards, and of 36,500 acres of simple coppice, whilst the rotations of 36,250 acres of broadleaved high forest have been reduced. 7,500 acres of coppice-with-standards have been converted into broadleaved high forest, 5,000 acres of simple coppice converted into coppice-with-standards; 5,000 acres of coppice-with standards and 9,500 acres of simple coppice have been converted into coniferous high forest.

As regards the demand for timber in Belgium, in 1840, only £187,920 worth of timber was imported. Imports of timber amounted in 1890 to £2,814,520, and in 1893 to £4,677,880. This is exclusive of £1,200,000 for bark, wood-pulp (£520,000),

matches, gun-stocks, masts, dyers' wood, furniture, etc., the total imports amounting to about £5,878,000.

The annual exports of wood from Belgium amount to about £600,000, so that the insufficiency of the production of wood in Belgium is evident.

The number of gun-licences for sporting purposes has increased from 5,566 in 1842, to 16,192 in 1904, producing about £25,000 a year, so that game is getting scarce. The following importations of live game have therefore been made in 1903-1904:—4,567 pheasants, 1,695 partridges, 497 hares, 22 roe-deer, and 7 hinds; also 41,125 pheasants' eggs and 740 partridge eggs.

The red grouse of Scotland has also been introduced into the forest of Hertogenwald and the surrounding heather land, where black-cock is fairly abundant.

REPORT OF THE TOUR.

The Forestry work of the Society began at the Exhibition at Liège, where the exhibit of Canada, with its forest produce, including beautiful oak panelling and bird's-eye maple, was first visited under the guidance of Mr. Crahay, *Inspecteur des Eaux et Forêts*, who then conducted the party to the Forestry section, which was excellently arranged. Some of the *tableaux* representing forest scenes, with the local mammals, birds, shrubs, and herbaceous plants were most striking. There were also excellent collections of wood from the different forests, with various wood manufacturers. Unfortunately the Society had not sufficient time to thoroughly inspect this splendid Exhibition. An interesting implement was the "*déracineuse Lobo*," an invention of Mr. Louis Boel, Engineer, 16 Place Roger, Brussels, for drawing out whole trees by the roots at the rate of fifty a day, which was later on to be seen at work in the Forest of Chenoy. (Fig. 1).

On Monday, August 14th, the first serious business of the week began with a visit to the Forest of Hertogenwald (17,095 acres), which is on an undulating plateau between 1780 and 2160 feet above sea level—the highest portion of Belgium in the S.E., and contiguous to Germany and Luxemburg. The forest originally

was oak and beech, but it was destroyed in the Middle Ages, the beech dying through being coppiced. The highest tree vegetation formerly was birch and scrub oak, now lying in the peat.

A start was made at 6-46 a.m. by train to Verviers, and then in carriages to the reservoir of La Gileppe, which supplies Verviers as well as the cloth-mills along the valley of the River Vesdre with water. The reservoir is situated in the ornamental working section of Pierreuse Heid. The rainfall is heavy, the mean annual fall according to Mr. Lancaster being 39·6 inches. The rocks are Cambrian slate and quartzites, producing a stiff clay soil; huge boulders of quartzite, occurring in a thin clay, are scattered over the Hautes Fagnes. In the rocky debris resulting from the construction of the dam and reservoir, the white alder (*Alnus incana*) was growing well. The trees were planted with a little soil among the unweathered rock, and have produced numerous suckers. The dam of the reservoir—a fine piece of engineering work—is 153 feet in height, length at base 266 feet, at top 997 feet, width at base 280 feet, at top 64 feet, volume 248,470 cubic metres. The middle of the dam is occupied by a colossal statue in granite of the Belgian lion, which is 42 feet high and 52 feet long. (Fig. 2, fig. 3).

Near the reservoir all good outlooks and walks are kept up, and exotics and ornamental trees planted, for the lake is much visited by holiday-makers.

Close by we passed through a pure oak coppice about 16 years old. The produce is sold for bark and pit-wood. Oak bark fetches £3 6s. 8d. to £3 15s. per ton. Some working sections of coppice-with-standards with underwood of thirty years' rotation in the process of being converted into high forest of oak and beech and a few maples, were traversed. These were intended to be kept for two more periods under coppice rotation before being converted into high forest, otherwise the revenues would fall off. Where there is too much heather on dry soils Scotch pine is planted first, and it is afterwards underplanted with beech when the pine is sufficiently high. The pine is cut when it is necessary to open out for the beech. In the valleys coppice-with-standards is maintained. Up to about 1500 feet Scotch pine is planted, and there are 875 acres of it; above that altitude the snow destroys the pine, which is replaced by spruce.

Under the Austrian Government, the Austrian foresters planted Scotch pine, and it was tried at 1,900 feet, but after fifty years the trees were about as tall as a man. Where it flourishes it attains a greater age than spruce, reaching up to 130 years. Thinnings of Scotch pine are made every six years. We were informed that in Flanders Scotch pine is actually planted about 1½ feet apart, and thinned at six years old, and 32s. per acre is obtained for six years' growth. 6d. per cubic foot standing is obtained in the Hertogenwald for the best Scotch pine. The beech in the forest sells at double that price.

There is a great quantity of pit-timber used in Belgium, every ton of coal raised requiring 10d. worth of timber, whereas in England the value of timber used is only 6d. per ton of coal. 25,000,000 francs or £1,000,000 worth of pit-timber is consumed annually by the mines in Belgium, and as the roofs of the workings are often brittle, faggots of brushwood, chiefly birch, along with the props, are used to preserve them.

As we ascended higher through the woods, we saw that there were four stages in the system of management: (1) coppice which is being transformed into high forest; (2) coppice-with-standards; (3) mostly Scotch pine with spruce above it; and (4) finally bare heather. Beech was growing well at 1,100 feet altitude. At this elevation it is too cold for rabbits, though there are plenty in the valleys. We then passed through a felling area with coppice 30 years old. They will fill up the area by planting beech. This is in the stage of conversion to coppice-with-standards at an altitude of 1,300 feet. (Fig. 4). The oaks are left to 150 or 200 years, as long as they continue to flourish. In the forest there are 5,000 acres still to be planted with spruce (it is too high for a mixture with broad-leaved trees) at the rate of 400 acres per annum. Already 7,000 acres have been planted. The altitude is 1,590 to 2,160 feet, and the soil at the top is peat on clay, the peat varying from 16 inches to 15 feet in depth.

As regards climate, a late spring is followed by a short but hot summer. Winter comes early and lasts long, with dense fogs and persistent snowfalls, the snow often lying till May and sometimes till the middle of June. Weymouth pine is mixed to some extent with spruce along the S.W. boundaries of the sections that are exposed to gales; and as it is attacked by the red deer, it

Fig. 4—Felling Area on the Hertogenwald.

Fig. 5—Trenching Peat at 2000 feet altitude.

Fig. 6—Some of the Demonstrators.

has to be fenced. A fine plantation of spruce, attaining a height of 85 to 90 feet, was growing near the highest part of the ridge, more than 2,000 feet above sea-level, and evidently sheltered by the higher lands. A new fungus (*Septoria parasitica*) attacks spruce badly; and the forest-guards at once cut out the trees which they find attacked. The ground at this altitude is largely covered by the great Bilberry (*Vaccinium uliginosum*), which bears a fine dark purple berry. The oldest of the spruce are 60 to 65 years. Thinning is begun at about 25 or 30 years, and repeated every five years after that. 16s. 8d. per acre is obtained for the first thinning, and for older thinnings up to £5 16s. 8d. per acre. The price works out to 3d. or $3\frac{3}{4}$d. per cubic foot solid.

The Government is planting this large area, the highest region in Belgium, to give some value to the land, and to improve the water-supply. Great precautions are taken against forest fires. The land is divided by two fire-lines 65 yards wide, and then crossways into blocks of 15 acres each. Fire-lines 33 feet to 66 feet wide divide the smaller blocks. The broad ones are cut for hay with scythes, and the narrow ones, where they sow a mixture of grass and leguminous seeds, manuring with 8 cwt. of basic slag per acre, are grazed.

There are four different ways of planting, depending on the nature of the soil. (*a*) *On fairly wet clay lands.*—Drainage trenches are dug 2 feet deep by 1 foot broad every 13 feet, the excavated soil being heaped up in two lines of mounds between the drains. Where there is peat above the clay, the trenches are deepened so as if possible to bring up soil from below the peat to mix with it. The mounds are left for two years to dry and weather, and then spruce plants are planted on them at distances apart of 7 feet by 5 feet. The other methods of planting are as follows:—(*b*) *On the drier clay lands covered by a thin layer of soil.*—Drainage is effected by trenches $2\frac{2}{3}$ feet deep and 20 feet apart, the soil being heaped up in three lines of mounds. Spruce are then planted as before. (*c*) *On dry lands with bad birch-coppice.*—The turf is dug up every 7 feet in lines $1\frac{1}{2}$ feet wide, and mounds of good soil are made in the lines every 5 feet. Spruce and Weymouth pines are planted alternately 7 feet by 5 feet. (*d*) *On deep peat.*—Experimental plantings are made on peat mixed with earth, manure and lime. Spruce are planted fairly close together with the intention of

eventually transplanting them with balls of earth on to the peat.

Planting is done in spring, in April and May, with a planting iron (*tarrière*), two years after draining. On peaty soils a mixture of basic slag and good soil is used with each plant costing about 10s. per thousand plants. The cost of spruce plants (2-2) is 6s.8d. per 1000, and the planting costs 5s. per 1000; and including plants 11s.8d. per thousand. That of Weymouth pine is 15s.10d. per 1000. The draining costs £1 13s. 4d. per acre for *b* and *c*, 25 per cent. more for *a*, and 50 per cent. more for *d*. The total cost amounts to £2 15s. 2d. for *b*, £1 19s. 2d. for *c*, and £4 5s. od. for *d*, per acre.

We had reached an altitude of 2,000 feet, and the forest officers gave us a demonstration of the trenching of the peat soil, and of the planting of spruce on the mounds. We had here a grand view of the lower country covered with forest growth, and gazed at distant Germany, which had appropriated, we were told, half the forest, after 1815, in order to "rectify the frontier." (Fig. 5, fig. 6).

Luncheon was provided at Hestreux, where the carriages awaited us, and the company was entertained with champagne by the Belgian forest officers. The forest-guards, who were invisible played "God save the King" on their horns, and the tent was adorned with the British and Belgian flags. The PRESIDENT proposed the toast of the health of the King of the Belgians, and said—

"The Belgians had always been our friends; but in the early times they helped to destroy our forests. For they got their wool from England, and in order to grow wool our coppices and forests were destroyed to supply pasturage for sheep. (Laughter.) At present, though we in England don't supply wool, they get it from our kin in Australia and America, so that the commercial union between the British people and the Belgians still continues. But besides this alliance of a commercial nature, we have had alliances against neighbours who were stronger than they. From the days of Queen Elizabeth and down to the time of the Duke of Marlborough, whose name is well-known in Belgium, as well as in the time of the Duke of Wellington, we have had friendly political relations with Belgium, and these, I trust, will continue, and prevent this vigourous, intelligent, commercial country, from being interfered with by its powerful neighbours."

Mr. G. MARSHALL proposed the toast of the health of the

Belgian Forest Officers, including Messrs. Cailteux, Crahay, Brichet, and Nelis, who had conducted the party so kindly throughout the day. To this Mr. BRICHET replied, and proposed the health of the Society.

The Inspector of Forests, Mr. CAILTEUX, then proposed the health of the King of England..

After luncheon, some plantations near Hestreux were visited, and instances of damage by *Coccus fagi*, and then by *Nectria ditissima*, were noticed; we measured a Scotch pine, 130 years old, 8 feet 1 inch in girth (24 inches quarter girth at chest-height), 65 feet high,with 150 solid cubic feet, and a spruce was cut down by two of the guards with a flexible ribbon bandsaw in one minute and twenty seconds.

Close by, at Croix Grisard, we saw fine *Picea rubra*, the red American spruce, extensively planted, height 45 to 50 feet, girth 33 inches, and bearing small cones. The age of these trees is 56 years, and the volume 4,410 cubic feet per acre at an altitude of 1,300 feet.

There was also a plantation of *Pinus rigida* (pitch pine), 48 feet high, 40 and 46 inches girth as measured, with very coarse bark, bearing large cones, and with three needles in each sheath. These were 55 years old; the volume before the last thinning, was estimated to be 6,958 solid cubic feet per acre.

There is no clear-cutting in the State forest, and no fixed rotation; the trees are felled when they begin to fall off.

The number of deer killed last year was 70, the forest holds 400; but the number should be only 200 for the area.

A long drive through the forest then took us back to the railway station, and we soon arrived at our head-quarters at Spa.

TUESDAY, AUGUST 15TH.

We left Spa at 7-6 a.m. by rail for Trois Ponts, and the Southern portion of the Ardennes. The line gradually rose with a steepish gradient, and we passed through woodlands of the Commune of Sart, consisting of birch and some Scotch pine. The town of Sart has given its name to the system of "Sartage," the practice of cutting the coppice and burning the dead rubbish and young

twigs, and scattering the ashes, and then temporarily cultivating field crops on the land. The system is still prevalent in the provinces of Namur and Luxemburg. The view from the train was a beautiful panorama showing good spruce woods at the higher elevations.

A glimpse was caught of the site of a recent fire in some birch woods. Soon we had ascended to 2000 feet, and saw peat being cut for fuel, and had a splendid view of the spruce forest, and then we made a rapid descent to Trois Ponts. Mr. Crahay told us that the prices for sleepers of the best oak was 5·85 francs (4s. 10½d.), inferior oak 5·10 francs (4s. 3d.), and 4·87 francs (4s.) for best beech, and 4·23 francs (3s. 6d.) for inferior beech in the rough. It costs 50 centimes (5d.) to creosote oak sleepers and 1·25 francs (1s. 0½d.) for beech sleepers, the latter taking up so much more creosote. These were prices delivered at any railway station. We passed through Stavelot, where there are many tanneries, and along the valley of the Amblève river. At Trois Ponts the formation is Cambrian schist, and the cutting near the station showed much folding of the strata. We alighted at the station in order to visit an artificial waterfall, the Cascade de Coo, and we noticed how the roadway was planted all the way with ornamental trees, such as the *Betula papyrifera* (Canadian birch), white ash of America, Japanese larch, *Quercus rubra*, etc. The Cascade is much visited and is very picturesque. The river makes a wide loop round the hills for several miles, and returns within a few yards at a much lower level. By a slight amount of cutting, the upper reach is connected with the lower, and a waterfall of some 25 feet is produced.

At Coo, oak coppice wood fetches £7 10s. 0d. per acre, standing. All is sold by public auction. The bark is stripped and sold for £3 5s. 0d. to £3 10s. 0d. per ton, and the rotation of the coppice is 18 years. The underwood is made up into faggots, which sell at 8s. 4d. per 100 bundles, and into round and split wood, about 4s. 2d. for 35 stacked cubic feet of round or split wood, both being made up together. It costs about 10d. to 1s. 3d. to a wood-merchant per stère (35 cubic feet) to work it up.

Whenever the wood is good enough, it is used for pit-props; oak is considered to be better than anything else for this purpose. In clearing a coppice, it is cut over from top to bottom of a slope

in compartments each year of the rotation, so that the produce does not pass through any compartment that is uncut.

At Remonchamps, we came to the Middle Devonian Limestone, and we saw an ancient castle, high up among the rocks, with its modern successor alongside. The Devonian formation has three distinct groups with carboniferous or mountain limestone above:—

Upper Devonian—*Psammite. Schistes de Famenne.*

Middle Devonian—*Calcaire givetien* (grottoes). *Calcaire Couvien.*

Lower Devonian—*Sandstone and Schist* (without any lime).

Cambrian.

The psammite of the Upper Devonian is a hard whitish sandstone with intercalated beds of clay, making splendid sets for flagstones and good building material. There were numerous quarries working close to the railway line; the sets go as far as Roumania, and all over Germany, and are much esteemed as paving stones. The Chateau Amblève was passed, situated on the top of the hills. Here and there on the limestone we saw spruce 30 years old, which were only 16 feet high, the soil being very dry; the trees are now beginning to grow, as the ground is getting covered; but for 15 years they hardly made any growth. On the top of the hills they were not more than 3 feet high. The rocks were very much fissured and folded. On the other side of the line we then saw the carboniferous limestone, dark in colour, used for making hydraulic lime. The Palais de Justice in Brussels is built of this stone. There is so much psammite that it is used in preference to the carboniferous limestone for roads. From Liotte, the carboniferous limestone crops out on both sides of the line as we went up the valley of the Ourthe, which runs into the Meuse at Liège, in the grounds of the Exhibition. At Rivage, the tilting of the strata had been such as to make vertical the beds of both psammite and carboniferous limestone, and these had therefore a very striking appearance, in some cases standing out like vertical walls. The Commune of Aywaille was offered £500 per annum for 5 acres of quarry of psammite for 27 years.

The Government intends planting up all the abandoned quarries, in order to enhance the beauty of the Ardennes.

We then approached some limestone on which were planted Austrian pines and a mixture of Scotch and Austrian pines. On very shallow soils the Austrian pine is planted, but the Scotch pine is associated with it where the soil is deeper. Twenty-five thousand acres of Austrian pine have been planted on limestone, where the annual rainfall is 15½ to 20 inches, in the forest of Wiener Neustadt, 50 miles from Vienna.

On the Upper Devonian, that we next traversed, the land was much more uniform and monotonous, the rock being flat and impenetrable to water, so that the soil is very wet in winter, and very dry in summer. The layers of rock, which are horizontal and do not crumble up, are called Schistes de Famenne, and constitute a very compact clay slate, giving rise on decomposition to a stiff clay, and on it spruce grows very badly. This formation extends to Marloie. The clay soil is very thin. It cracks in summer, and in the winter, ice forms in the cracks, so that the ground lifts up in spring, rendering planting a difficult operation; it is done with two-year-old plants upon a sod well grazed before planting. We saw some plantations of Scotch pine which had been sown broadcast. There is a want of bold outline in the landscape, which is very uniform in character. A great deal of surface drainage is necessary, the drains are cut 13 feet apart, and the trees planted three feet apart. There was no beech, the land is too compact, but some birch and oak coppice. The oak is very short in the bole, but of excellent quality on account of the richness of the clay in potash. Some very fine standards of oak and birch were seen, the underwood being hornbeam and oak with a rotation of 24 years. In the State Forests the rotation for the underwood is raised to 30 years. The agriculture here also is very poor, the land being heavy and difficult to cultivate. Higher up there was Scotch pine.

As we approached Jemelle, we saw a large extent of good agricultural land with substantial farm buildings. At Marenne, near Marche, 759 acres of *P. sylvestris* had been lately planted. The soil here at Marenne is the Middle Devonian limestone (*calcaire givetien*). This formation extends to Jemelle and Rochefort. The plantations on the northern aspect are very much

Fig. 7—The Devonian Limestone at Rochefort.

Fig. 8—Austrian and Scotch Pine with underplanted Beech at Rochefort.

Fig. 9—Scotch Pine and Spruce of the same age at Rochefort.

finer, and consist of Austrian and Scotch pine; but on the dry southern aspect only Austrian pine is planted. The River Lomme has swallow-holes, and disappears in the limestone to reappear further on. In order to build the church at Rochefort £4000 worth of timber were felled from woods belonging to the town, £500 being of broadleaved wood, the rest of pine. We saw a mixture of Austrian and Scotch pine. The Austrian is ultimately thinned out, and beech is then underplanted, the object being ultimately to obtain a beech wood. Wherever possible they have a mixture of the two pines, because they can put in beech among the Scotch pine when the Austrian pine has been cut out. The oldest wood of Austrian pine was planted 30 years ago.

After leaving the train, we walked to the Communal woods of Rochefort, and saw the slopes covered with Austrian and Scotch pine, and underplanted with young beech at a height above sea level of over 800 feet. (Figs. 7 and 8).

Mr. Crahay, the Inspector, who himself planted some of these bare slopes 16 years ago, gave a lecture, which was listened to with marked attention. He said that the soil is on Devonian limestone, and owing to the nature of the rock is full of cavities. The rainfall is 30 inches per annum. The water goes into swallow-holes and only reappears when it comes to impenetrable strata, except in the winter, when there is an abundance of water. The water will not come back by capillarity to the surface, so that it is an extremely dry and thirsty land. On the plateau there is very little soil, indeed, it is extremely dry both in spring and summer; on the east and north aspects, however, there is a deep soil. We are visiting the south aspect. The Scotch pine does well enough when the soil is sufficiently deep, but the foliage only making a slight cover, does not shelter the soil sufficiently. The Austrian pine gives more wood at the same age. Scotch pine is preferred for pit-props at the mines, and a slightly better price is given for it. The ultimate object is to grow beech, which gives a permanent cover to the ground. The Austrian pine gives so much shade that beech will not grow under it, but it grows under the lighter Scotch pine. It is essential before planting to get a crop of grass on the ground, and to have a good sod on it by grazing with sheep. The soil above the limestone is nearly all clay, and is liable

to be lifted by frost, so that the presence of the grass prevents the lifting of young plants, which is so dangerous on bare soil. It is therefore very important to have a sod of grass on which to plant. Big plants will not succeed: two-year-old seedlings or two-year-old plants which have been transplanted once are used. Sowing has also been tried, but it is not certain, though it has sometimes succeeded. Sowing is done in the spring (February and March), and planting in autumn, from September to November, as soon as there are good autumn rains. Flat stones are put round the plants to preserve moisture and to keep the plants from being lifted by the frost. Corsican pines are also planted, two years old, that is, one year in the seed bed and one year planted out; good seedlings or transplants only are used. Mr. Crahay had made experiments in spring and autumn planting, and considered the autumn much better on account of the dryness of the spring. The percentage of failures depends on the season, and is about 15 per cent. Fifteen years ago they tried Corsican pine. The distance between the trees is 1 metre (3 feet 3 inches). In some cases, the land is so arid that they brought soil and planted 1·25 metres apart. On horizontal strata, which weathers so slowly, the soil is thinnest. The best results are obtained when the butt-ends of the rocks are exposed, as more soil is formed. These woods are 27 years old. The little beech trees among them were planted three years ago. Three thinnings up to the present have been made of the dead and dying trees only. The town of Rochefort possesses woods of its own, and uses the revenues for public works, such as the building of bridges, churches and the construction of waterworks. The interest taken was shewn by the number of questions addressed to Mr. Crahay after the lecture.

We then passed to a very healthy looking plantation, which Mr. Crahay himself planted 16 years ago. Some samples of the trees were measured: Austrian pine (1) 30 inch girth, (2) 7 inch diameter, (3) 19½ inch girth, (4) 18 inch to 19 inch girth; average height about 36 feet. The Scotch pine averaged 15½ inch girth.

Oaks and other broadleaved trees, such as the beech, are introduced under the pine to some extent, by sowing in years when the seed of these species is plentiful. The sowing is effected by the guards, who use a little spud for the purpose.

They do not prune, nor thin otherwise than by removing the dead trees every five years.

We then saw another area where both sowing and planting had taken place. The grasses on the ground were chiefly golden oat, cocksfoot, *Bromus*, *Brachypodium pinnatum*; *Monotropa Hypopitys* (bird's nest) was also present. We saw spruce older than the pines, and not so high as a man, quite a failure; the pines, however, were 33 feet high. (Fig. 9). There was much less grass on the ground where there is Austrian pine. We came out of the wood on to some cultivated land, where a crop of bearded wheat—"*épéautre*"—was being harvested. This is a variety used on poor soils, and it gives the best bread, and we saw also a crop of Sainfoin.

This land, before planting, only gave from fourteen days to three weeks sheep-grazing in the year. It must be remembered, that, in what is called the limestone-schist zone, thousands of acres are absolutely unfit for agriculture.

The woods also give shelter to the crops around, and produce a dampness in the air which benefits the crops. The amount of dew is very striking. Dew is deposited now that the woods are planted, where practically there was none before. A good specimen of *P. montana* was seen, and some Corsicans, which were photographed. 4000 plants were used per acre, at 4s. 2d. per thousand, the cost of planting being £1 10s. 0d. to £2 per acre, including the price of plants. The planting is done with a special kind of grubber, something like a pickaxe, (handle 3 feet long, blade about 18 inches) very pointed where it goes among the stones. A demonstration was given for our benefit. On a slope we traversed a crop of young beech planted under larch that had become diseased. The beech was 18 years old and very stunted. *Epipactis latifolia* and *Juniperus* were noticed. Close to Rochefort again a splendid section of the Givetien limestone was exposed.

After a cup of tea at Rochefort, we mounted our carriages for a drive to St. Hubert, 15 miles. This was along a main road planted with trees, and we observed the one-leaved ash and common ash by the roadside; also *Acer platanoides*, *A. pseudoplatanus*, *Juglans nigra*, and a small crop of tobacco in a garden. The agricultural land, undivided by hedges, bore clover, oats, sugar-beet, mangolds, and potatoes. Cattle were grazing on the "seeds," herded by

a dog and a man, or sometimes by a woman sitting knitting. The isolated houses were all numbered, and were really good buildings, hardly a single poor looking cottage being seen. We passed a plantation of Scotch pine with very crooked boles. The ascending drive was very interesting, though the pace was slow, cultivated lands and woodlands alternated, the corn crops being cut close to the ground, and the splendid crops of clover were evidently left for seed. After traversing a fine wood of dense oak coppice-with-standards, we passed in the moonlight through part of the royal domain, consisting of a fine beech forest; finally we arrived at St. Hubert at 9-30, instead of at 7 p.m., after a most enjoyable ride, varied by a considerable amount of pedestrianism up the hills. Justice was done to the excellent dinner awaiting us at the Hotel du Chemin-de-fer, and after some little trouble, all the 80 travellers found their quarters in the little town, dedicated to the patron Saint of foresters and sportsmen, which lies 1,300 feet above sea-level.

WEDNESDAY, AUGUST 16TH.

A start was made at 7-40 a.m. by steam tram from St. Hubert for Poix, with Mr. Pollet, the local forest officer, in order to visit the Domain of Mirwart, where the forest is managed by Dr. Schlich. The property was formerly partly owned by him, and partly by the family von der Becke, to whom the estate now entirely belongs. This visit was eagerly looked forward to by the party, to whom, Dr. Schlich, as the head of the Cooper's Hill Forest School, is so well known an exponent of true sylvicultural principles. The morning was damp, and there had been heavy thunderstorms in the night with thunder and lightning.

The system of *sartage* was observed on the right side of the tram line. The corn crop growing among the coppice stools was in stooks, and showed a good length of straw. The coppice is cut, and the twigs laid on the ground and burnt. The corn is sown broadcast, and comes up together with the coppice. The only standards left were birch, the shade of which is not too great for the crop. This land lies about 1000 feet above sea-level. Some spruce beside the line shewed splendid growth, the leaders being 2½ to 3 feet long. (Fig. 10).

Fig. 10—Sartage, corn crops among birch coppice-with-standards, near Poix.

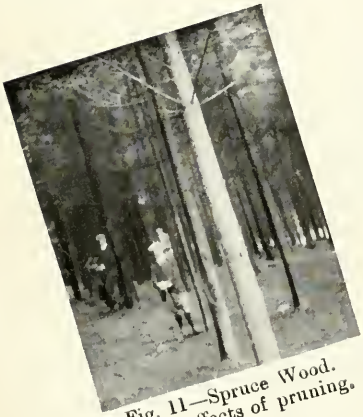


Fig. 11—Spruce Wood. Showing effects of pruning.

Fig. 12—Forest of Mirwart. Natural regeneration of Beech in Biolin.

Fig. 13—Scotch Pine wood in Biolin, 30 years old, grown from seed.

A section belonging to a private owner, altitude 1000 feet, under pine five years ago, was sold for £32 per acre when 32 years old. The soil had been much improved, and after the branches and refuse were burnt on the ground, the land was let for £1 per acre for crops. The rent previously was only 12s. per acre. In another section was a coppice of birch, with standards mostly of birch; it is cut every 20 years. Immature birch standards are left, those fit for pit-props are sold with the underwood, and the saleable produce carted away; the refuse is put into heaps, or spread over the land, and burnt. The villagers afterwards cultivate the soil; they are compelled by the Government to manure with 8 cwt. of basic slag per acre, and then they sow oats or buck-wheat. This arrangement, with 20 years rotation of underwood, yields far bigger field-crops than under the ordinary rotation. The Government makes a regulation that only one or two field-crops shall be taken in successive years after pines, and only one field-crop after the coppice is cut over. The Communes take one field-crop after pines, while private owners take two. These woods are 55 miles from the coal mines where they dispose of the pit-wood.

At Poix, on the way to Mirwart, we saw a very interesting sawmill, containing a lot of split oak, but the proprietor would not let anyone visit it; probably because there was a chemical factory in connection with it. Staves of beech are used for packing zinc, as the zinc ore is exported in casks from Belgium. Best beech sells at 10d. per cubic foot in the forest. The beech we noticed in logs—which comes to this sawmill from everywhere for hundreds of miles—was very soft. A lot comes from Alsace; it is not fit for shuttles, being closely grown. Alder is all sold by cubic foot, at about one-third the price of beech, and is used for clog-making.

Continuing our journey up the valley of the stream we saw some fine *Populus nigra* (not *canadensis*). We then passed a spruce wood, where we observed some exudation of resin in the boles through pruning. This species should never be pruned, as hard knots are formed in the timber, though the operation is permissible with silver-fir. The wood was thirty-five years old, planted 3 feet apart, about 950 feet altitude, and was badly managed. Spruce grows in this district very much better than that on the Devonian limestone that we saw the previous day. The formation is the lower Devonian schist, and makes a deeper soil. The spruce yields

7 cubic metres per hectare annually, or 100 cubic solid feet (75 cubic feet quarter-girth measure) per acre. Up to quite a short rotation of 40 years, this is the mean increment. For that, about £1 per acre is obtained. Spruce is not usually grown for more than 40 years; the maximum annual increment is 100 cubic feet per acre (quarter-girth measurement). (Fig. 11). Dr. Dechesne, an ex-Mayor of St. Hubert, states, that in 1905, two and a halt acres of spruce, fifty years old, at Bastogne, 1,200 feet above sea level, was sold for £960.

The meadows here are all irrigated, there is no limestone and the moisture is held near the surface. The rent of the irrigated meadows is 45 francs per hectare (or 18s. per acre). The rainfall is 40 inches per annum. Scotch pine does not give such good results; it yields about 70 cubic feet per acre, or 20 per cent. less than spruce. The value of Scotch pine is, however, greater per cubic foot than spruce, so that loss in yield is gain in money. The climate and soil suit spruce better. At 40 years old Scotch pine sells for £50 an acre. Over 1300 feet, the Scotch pine is crushed by snow and will not grow profitably above St. Hubert.

We then went through a private wood belonging to an individual owner, then into a wood belonging to a Commune. The principle of management of these Communal woods is the same as elsewhere in Belgium, to increase the proportion of beech as much as possible and besides the beech—oak, sycamore, and Norway maple, with hornbeam underwood are grown. They are not satisfied with coppice-with-standards. The object is gradually to transform into high forest of beech, oak, etc., and give up the coppicing system. When they cut the underwood, they reserve every seedling of beech. The reproduction depends on the years of seed, the last beech-mast year being 1898. One seed-year is expected every 10 years, and this year there will be a fine crop of beech-mast.

We noticed that the beech, and even the spruce, had suffered from the effect of the hard frost on the 23rd May*, which was quite exceptional. The rotation is 25 years for the underwood, but

*See Meteorological Weather Report. This was the night on which the thermometer in the air fell at Llangammarch Wells to 26 degrees, and on the grass to 16.5 degrees at Worksop, 20·3 degrees at Marlborough, 20 degrees at Rauceby, and 22 degrees at Wisley.

a gradual transformation to high forest is taking place. There is in one wood such a crowded number of standards that the underwood during the rotation does not reach the size for pit-props, and it is therefore used for fencing the agricultural lands. Fairly large aspen were seen.

There is a great demand for sycamore, and Norway maple sells better than beech; both are used for white wood manufacture, and birch for wooden shoes. The oak fern is plentiful.

We then saw a clearing that used to be cultivated once in 20 years by the inhabitants, but which is now planted up by the State for the Commune, and the latter pays the expense. One year old seedlings of Scotch pine were used at distances of 3 feet 6 inches, the plantation being now about 30 years old. Any burning of heather produces a crop of broom, which stifles the forest plants. The heather is therefore preserved, and it is cut only wherever it threatens the plants. Heather is very useful, protecting the plants from the frost, and it keeps the soil down, thus preventing the lifting of the plants, for spring frosts are very severe. The Scotch pine is usually sown and not planted. The broom is cut back for two years in the summer after the sowing in order to kill it, while the heather is cut only in order to sow upon it without any object of killing it. They use 4 to 6 kilos per hectare of seed (3½ lbs. to 4½ lbs. per acre). Planting and sowing takes place in April, as soon as the snow is off. The Forest Officer, Mr. Pollet, preferred planting to sowing. The planting costs 60 francs per hectare, including cost of plants (20s. per acre). A ditch is made all round the plantations, and spruce is planted as a shelter-belt 3 or 4 lines deep at the margin.

We then came to the little village of Smuid, at the entrance of which was a notice board, containing the sign "Mendicité interdite" (Begging forbidden). In the adjoining village of Mirwart any new resident must pay a bonus of £50 to have a share in the Communal lands. Scotch pine is now considered to do much more good to the soil than spruce, as after clear cutting beech is planted easily, but after spruce the broom grows so readily they must take a "sartage" to clean the broom away, the seed of which will remain 40 or 50 years in the ground and retain its vitality. Broom springs up when they sow basic slag on ground covered with heather.

Mr. Max von der Becke, one of the owners of the forest of Mirwart, joined the party on the way up the hill to the village, along with his forest guards, including one whose father had the reputation of being able to compute the value of a tree to a franc. The following account is written by Dr. Schlich :—

The history of the domain of Mirwart goes back to the ninth century, when the estate belonged to a Count of Hainault. It changed hands repeatedly, and one of its proprietors was Adolphe de la Marche, known as the Wild Boar of the Ardennes, and referred to in Scott's grand novel "Quentin Durward." The estate is now only a fraction of what it was formerly. It was purchased, in 1891, by Mr. J. P. von der Becke, of Antwerp, and Dr. Schlich, of Cooper's Hill. In 1903, the latter sold his share in the property to the family von der Becke, to whom the estate now belongs. The area is as follows :—

Woods	2,875 acres
Fields and Meadows	425 acres
	3,300 acres

Dr. Schlich has managed the woods of the Mirwart estate from 1891 until now. He found by far the greater part of the area stocked with an irregular crop, consisting of oak and beech, with a moderate amount of hornbeam, sycamore, birch, aspen, and ash. Originally, the method of treatment had been coppice-with-standards, but owing to haphazard management continued during a long period of time, some parts had grown up into high forest, others were still coppice-with-standards, and others again coppice only. The latter consisted of very old stools, producing only feeble shoots. Throughout, the woods were incompletely stocked, and contained a large proportion of inferior trees, which, instead of the better class of trees, should have been cut out before.

The annual increment was very small, and the value of the underwood almost nil. Under these circumstances, Dr. Schlich decided on the following system of management :—

1. Reservation of all fairly good stems, unless absolutely mature.
2. Removal of all inferior trees.
3. Filling up the woods with a species which would yield a quick return.

As to the latter, the choice lay between Scotch pine and spruce, since experience has shown that larch always became quickly diseased to such an extent that it is practically valueless. This is probably owing to injuries by deer and hares, as there is a fine road-ride avenue of larch trees, close to Mirwart.

The proprietors count on selling the conifers that are being planted at a comparative early age, as pit timber. For this, Scotch pine is more valuable than spruce, but, on the other hand, spruce yields a larger volume, and is less liable to disease and to breakage by snow. Moreover, Dr. Schlich found that Scotch pine in the higher Ardennes invariably begins to fall off in vigour at the

age of thirty-five to forty years, and if the demand for pit-timber should decline hereafter, it would not be possible to maintain Scotch pine woods until the trees become large enough to yield saw-mill butts, or timber for construction. Under these circumstances, he decided in favour of spruce as the principal species, with Scotch pine and Weymouth pine on a smaller scale, here and there.

Between the years 1892 and 1902, Dr. Schlich dealt with some 2,000 acres in accordance with the method explained above. He sold the material felled, which realised £32,000 net, and replanted the 2,000 acres at a cost of £3,500. Subsequent tending has cost another £500, or a total expenditure, under the head of planting and tending, of £4,000, equal to about £2 per acre all round. As to the tending, it consisted chiefly of cutting back the coppice shoots and of some young birches and bracken that threatened to overpower the young spruce, and in pruning epicormic branches from oak.

The first section of the Mirwart woods that we entered was Biolin, consisting of 276 acres, divided into seven compartments of about 39 acres each. There are no larch nor silver-fir, for the deer destroy these, there being between 200 and 300 deer in the whole of the woods. When Dr. Schlich commenced the management in 1891, he found a great deal of timber was over-mature, and in other places thin. His plan was to reserve all good stems, the wood was to be filled with species which would give a quick return: either Scotch pine or spruce. The conifers are to be cut early, the main crop is to be oak and beech. The deer prefer the oak to the beech. In Biolin we saw some good natural regeneration of beech, and the planted spruce were growing very well. In a second compartment there was sufficient stock to form a high forest, so it was left alone. The trees are removed on the selection system. (Fig. 12).

Another compartment was stocked with Scotch pine, 30 years old, thinned five times since 1891, 48 feet high, average girth 19 to 20 inches. It has grown very quickly, and the five thinnings have yielded about £11 per acre net. In another eight years the wood is expected to yield (sold for pit timber) £64 per acre, or a total return including thinnings of £75 per acre. It was sown with 8 lbs. of seed per acre, after cultivation from time immemorial, the ground being harrowed and seed broadcasted. We saw there an example of damage by *Pissodes pini*, and the roots of the trees attacked by *Fomes annosus* (*Trametes radiciperda*), of which we found the fructification at the base of the stem. This disease is common whenever pines are planted after agricultural

cultivation all over Germany in the first crop of trees, but it disappears in the second forest crop. Young oaks were coming up among the Scotch pine, the acorns being brought there by jays and squirrels. When the pine is cut over, in 10 years time, the hardwoods will have reappeared, and it will either be stocked with spruce or converted into a broadleaved wood. (Fig. 13).

The fourth compartment, which we then visited, contained some bad coppice which had been cut back in 1899, the birch being reserved and a few little oak saplings; it has been planted up with spruce and filled naturally by birch and a few Scotch pines, the oaks are also natural. It suffered at first from frost, as there were not enough standards, but it has now recovered. The Scotch pines will not prosper for more than 40 years, as they become diseased owing to the damp climate and the snow. There are also oaks coming naturally under the Scotch pine. A photograph of Mr. von der Becke, the foresters, and the President, was taken near a feeding rack covered in for the use of the deer during winter. (Fig. 14).

In a fifth compartment we saw a blank in which oak had been planted one year ago. One year old plants, inserted by the planting iron, had been used, and the cost of labour in this case was—girls being employed—1s. per day. We noticed both sessile and pedunculate oak growing—all continental foresters prefer the sessile oak at this altitude. The reserves in Biolin consist of 9,164 oaks, 7,479 beeches, 1,593 other trees, giving an average of 77 trees per acre.

We then passed to the Bois de Smuid, an area covering altogether 480 acres, where we saw a portion wired in against deer where there was splendid natural regeneration. The wood had more of the character of high forest: there are oak plantations consisting of one year old oaks planted in 1900, and the underwood is cut to free the oaks whenever it threatens to overpower them. The planting, etc., costs about 15 francs (12s. 6d.) per acre, and a certain amount of underwood is left to protect from frost. The ground is cultivated about one foot deep, and about a foot in breadth, and Dr. Schlich's wedge-shaped planting iron is

Fig. 14—Feeding rack for deer in the Forest of Mirwart.

Fig. 15—A metalled forest road in the Forest of Mirwart.

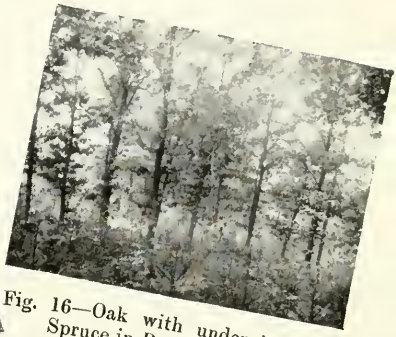


Fig. 16—Oak with underplanted Spruce in Pres Mouflet.

Fig. 17—Spruce in Les Loches, Forest of Mirwart.

used. The oaks are planted in lines about three feet apart, 15 inches from plant to plant: 8,000 plants per acre are put in wherever there are blanks and the soil is suitable for oak. In this wood we traversed a well-metalled forest road, the state of which showed that good roads are considered essential. It cost 3s. 2d. a running yard and was 16 feet wide with 10 feet of metal. Roads are being made gradually. (Fig. 15).

We then proceeded to a beech wood resembling the Chiltern Beech Hills. Some of the beech gave quarter-girth measurements of $15\frac{1}{4}$, $18\frac{1}{2}$, $17\frac{1}{4}$, $20\frac{1}{2}$; height of timber, 45 to 50 feet. The taper was slight, Mr. Marshall considering that it was only $1\frac{1}{2}$ inch fall from 6 feet to 25 feet, the mean height. Some of the trees have a total height of 85 to 90 feet. Nearer the castle, beech trees are still taller—up to 120 feet in height. Possibly there are 7,000 to 8,000 cubic feet per acre, with 70 to 80 trees to an acre. Wherever the crop is almost pure beech it is left alone till a beech mast-year, and then it will be regenerated naturally, as during the present year.

We then entered the Communal woods, outside the estate, where we saw an example of a sowing stifled by broom, where seed had been sown broadcast.

There are fifteen acres of tanks for trout-breeding in Mirwart. The common brown trout is preferred to the rainbow trout.

Prés Moufflet. Area 104 acres in four compartments of about 26 acres each. There was a big stock of oak, and along the pathway we observed the spoor of a red deer, which had passed along recently. The spruce were planted in 1897, plants 2 by 2, or 4 years old. Many large boars are shot in winter, especially in the oak woods, and a buzzard was shot in this wood last year. On the higher land there was beech, the growth of the underplanted spruce being splendid, many leaders 3 feet in length. The oak was mostly pedunculate down below, and on the higher land sessile. The birch in places needed to be cut back. The number of reserves are:—Oak 4,183, beech 2,503, others 444, total 7,760. Average 76 per acre. (Fig. 16.)

Les Loches. Area 450 acres planted in 1893, at a cost of

£1 10s. 0d. per acre, and therefore 15 years old from seed, and 12 years from planting; a few Weymouth pines also. The red deer taste everything, but don't care about spruce; over 40,000 oaks, three years old, were planted between 1893 and 1896. The spruce were three and four years old, and 1,300,000 had been planted; 76,000 Scotch pine (three years old) in frosty places; oaks, three years old, 43,000, with a few Weymouth pines.

Cost of planting	£540	0	0
„ tending...	151	0	0
	£691	0	0

The paths, which run along the sides, and render the woods easily accessible, cost ½d. per yard to make. We saw here damage done by *Nematus abietis* (the sawfly caterpillar) eating the spruce needles. The spruce were about 14 feet, and the whole wood was doing excellently. We then saw the oldest spruce, which were up to 18 feet in height. (Fig. 17).

The number of reserves in Les Loches :—

Oak	14,240
Beech	7,259
Others	1,653
	23,152
Per acre	51

The hornbeam is used to make the ninepins in the game of skittles ("quilles"), which are played in every village in Belguim.

The price of oak is 40 francs per cubic metre, solid (11d. per solid cubic foot). The epicormic branches of the oaks which are interfering with the young growth should be pruned, and the birch, which is so prevalent, cut back.

We then made our way back to Poix, after a long and enjoyable tramp in a somewhat close damp atmosphere, and lunched at the Hotel de la Poste, kept by Constant Henrotin-Rabe, to give it its full designation. Mr. von der Becke presided, in the absence of Dr. Schlich, who kindly entertained the whole party to luncheon.

At the outset, Mr. von der Becke read a telegram to the President from Dr. Schlich, from St. Blasien in the Black Forest. "*Hearty greeting, sorry cannot be with you.*" This welcome was received with applause, and the President at once sent off the following reply:—

> "*Dr. Schlich, St. Blasien, Schwarzwald. Many thanks for hospitality and telegram; regret your absence. Delighted with Mirwart. Spruce in Loches magnificent.*"

Mr. G. MARSHALL proposed, amid cheers, the toast of the day:—

"Gentlemen, I have the honour to propose the health of Dr. Schlich and of Mr. von der Becke and his brother, whose beautiful estate we have been over this morning. You have heard the telegram, but I know from personal knowledge how much Dr. Schlich regrets not being here; you could not get a more charming companion or a better fellow, and we are sorry he was unable to show us the woods himself. I cannot enlarge on what we have seen, which has been one of the most interesting woods we have visited for some years. We have seen a forest that was formerly very badly treated, now managed in a business-like way, and put into such a state that it will, after a comparatively short time, ensure a considerable income. I give you this toast most cordially, and couple it with the name of Mr. Max von der Becke."

The toast was received with enthusiasm, and Mr. VON DER BECKE, who is a charmingly modest gentleman, in reply, said in excellent English:—

"Only two words. I wish to thank Mr. Marshall. I am very pleased to have made your acquaintance, and to have gone with you into the woods of Mirwart. I am sorry Dr. Schlich has not been here, but I hope to see you again, and to receive you on that visit at the Castle." (Cheers.)

The PRESIDENT then said:—

"I wish to propose the health of the Forest Administration of Belgium. We have seen already what can be done with forests on poor soil. In the Ardennes they have to contend with great difficulties. Mr. Pollet wished us to see the Crown forests of which he has the charge, but unfortunately it is impossible to do so on this occasion. Every village in the mountains also has its own forests, and they get revenue from them to execute public works, and the State has a Forest Department to manage them. Mr. Pollet controls a large number of these Communal woods, as well as the large Crown forest we passed through last night."

Mr. Pollet's health was then drunk, and he replied in French.

Soon we had to leave to catch the train at 2 p.m., and got from it a glimpse of the Castle of Mirwart standing on an eminence surrounded with woods, and irrigated meadows of a beautiful green below the Castle along the River Lomme. A section of rock showed that a deep soil is obtained on this formation, a great contrast to the limestone rocks of Rochefort. We made a rapid journey to Brussels, passing through Ottignies, where the Silurian formation, which is rare in Belgium, is found in the valleys. We caught glimpses of the magnificent forest de Soignes, which we afterwards saw on Friday, of which Mr. Crahay gave us an interesting history. On arriving in Brussels, we took up our quarters in the Grand Hotel Britannique, Place du Trône, and in the Hotel de France. We were soon all accommodated.

THURSDAY, AUGUST 17th.

Woods of Chenoy.

On Thursday, 17th, after early Café au lait, we left Brussels with Mr. Crahay by the Luxemburg station at 8-8 a.m., for Villers-la-Ville, the site of an old Cistercian Monastery in ruins, of which the mill is now converted into a Restaurant and Hotel. The woods known as the Domaine du Chenoy, formerly belonged to the Abbey, but are now the property of Mr. Boel, Senator, who had kindly given us permission to visit them. Our attention was first drawn to a fine cutting of the Silurian strata, which occurs in the valleys. Though we were now only twenty-two miles south of Brussels, the formation exposed below the tertiary sand is the same as in the Ardennes, for the Cambrian is found at Court St. Etienne at an altitude of 220 feet, and then at Villers-la-Ville the Silurian occurs at an altitude of 390 feet. The district, therefore, was like the Ardennes in miniature, valleys, ravines and streams of clear water being again present. Some very fine white poplars (*Populus alba*) were first seen near the ruins of the Abbey, being 90 feet high and 4 feet 4 inches in girth. (Fig. 18). A little plantation contained some conifers growing well:—Sitka spruce, 9 to 10 feet high, and about six years old, very much better than the adjoining Norway spruce, only 5 feet high, though planted at the same time; and also the green Douglas and the Colorado

Fig. 20—Scotch Pine wood 26 years old, at Chenoy, on the sand.

Fig. 18—White Poplars at Villers la Ville.

Fig. 19—A roadside plantation in the Domain du Chenoy.

Fig. 21—Hardwoods on the loam at Chenoy.

variety. (Fig. 19.) We were then informed that 5,000 rabbits were killed annually on the estate, which consists of 2,087 acres, comprising 1,000 acres of coppice-with-standards, 337 acres simple coppice, and 750 acres of pine woods. Above the Silurian rocks the soil is formed by the disintegration of tertiary and quarternary strata. The tertiaries are represented by the Bruxellian sand, of which we had seen examples in the railway-cuttings, consisting of very poor and pure quartzite sand, white and yellow in colour. Above this, in places, is *le limon*, the Hesbayan loam, a more or less thick quarternary deposit, which is probably glacial, though there is nothing to prove it.

In the woods of Chenoy four or five valleys run from east to west. On the slope facing south where we first stood, the loam formerly covering the sand had been washed away by rain, and the Bruxellian sand was exposed. This sand was covered with heather and is difficult to plant. Trenches are cut through the heather soil, which is thrown into ridges. This costs 1 c. to 1½ c. per metre when trenched by contract, and as there are 10,000 metres per hectare, the cost is about £1 13s. 4d. per acre for trenching. The turf is thrown up in the intervals on either side. The distance between the trenches is about 3 feet 3 inches. 20,000 plants per hectare (8,000 per acre) are used. One man and a boy can plant 4,000 plants in a day. The place is swarming with rabbits, so they put in an enormous number of plants on that account, the plants being about 1½ feet apart. What is dreaded is the drought; frost is slight. The price is 3s. 4d. to 3s. 9d. per thousand plants of Scotch pine, and the cost of planting, including the price of the plants, 32s. per acre. One year old Scotch pine costs 10d. per 1,000. The wire-fencing, about 3 feet high, costs 4d. to 5d. per running yard. This first piece was planted last year, and was looking well. We also saw an area planted four years ago. Some heather had grown up. The contractor engages to cut the heather back for two years. Behind this was a plantation 26 years old, which had been sown broadcast. The land was hoed to a depth of 15 inches; wherever old pine woods are cut, hoeing can be done, as the roots are valuable for firewood, and will pay the expense of hoeing. Planting is done as soon as possible after cutting the trenches. 8 francs per hectare (2s. 10d. per acre) are paid to cut the bracken back twice each year during the first five years

There is little bracken at first, it comes a little while after planting, being encouraged by the shelter, and consequently increased moisture of the soil. (Fig. 20).

On the plateaux and slopes facing north and east the superficial layer of loam remains and is not washed away, and so there is a magnificent crop of broadleaved species. The contrast was most marked in passing from the sandy soil on the southern slopes and aspect to the deep loamy soil of the plateaux. Fine oaks are seen close by the sandy soil. A beech was 85 feet high, 17½ inches quarter girth at six feet, and an oak measured 70 cubic feet. (Fig. 21).

A little way further on the company gathered round Mr. Crahay, who gave one of his instructive lectures, the purport of which follows. There is excellent soil at the top of the sand. In fact, a portion near is agricultural land, but only let at 50 francs per hectare (or 16s. per acre). The owner is not satisfied with this rent, and has determined to plant it up like the adjoining land, because the returns under wood would be much greater. The rent for farms on similar land is 80 to 120 francs per hectare (about 33s. per acre). As the Belgians see a wood famine before them, and prices are already rising, they are planting as much as possible. They are actually converting coniferous high forest into coppice-with-standards. Scotch pine is grown as an ameliorating species, and when the soil is improved, broadleaved trees are put in, and any that spring up naturally, including oaks, are allowed to remain. After the pine wood is felled, they underplant with broadleaved trees. The State goes further, and prefers to have high forest, whereas private owners and Communes want to have ready money, and like coppice-with-standards to bring in revenue as soon as possible. A good coppice-with-standards will yield 100 francs per hectare per annum (£1 13s. 4d. per acre). The Belgian Government lends officers to private people to manage their woods, and so Mr. Crahay manages this wood for Mr. Boel. This forest brings in 90,000 francs a year for 900 hectares, a revenue of £3,750 from 2,250 acres of woods, i.e., £1 13s. 4d. per acre per annum, in spite of the fact that a large area is young wood, and there is an enormous number of rabbits. This is the gross return, but as the owner holds the game, it is considered that the game will meet the expenses, so that the above may be taken as the *net*

return. The shooting, if let, would produce 15 francs per hectare, or 5s. an acre. The chief game is roebuck (fifty) and rabbits; moreover, more than 1,200 hares, 900 pheasants, and lots of partridges were shot last year.

The loam is an excellent soil. When a coppice-with-standards is aimed at, different species are mixed; rapidly growing species being first planted to supply cover to the soil and give shade—first the white alder, black alder and little willow, and after that oak, ash, and larch; elm along the borders; white poplar, sweet chestnut in the shady places; American oak and American ash; while hornbeam comes of itself. This wood was planted six years ago, and was cut back two years after planting, everything being cut back, except elm, chestnut, larch and birch to give shade. Measurements of some of the plants (six years planted) on this soil are as follows :—

Species.	Height.	Girth at Chest-Height.
White Alder ...	16 feet ...	5 inches
Sallow ...	14½ ,, ...	4½ ,,
Birch ...	14 ,, ...	4¾ ,,
Sycamore ...	12½ ,, ...	3¼ ,,

The height four years after the plants were cut back is about 15 feet. The growth was really marvellous. The future rotation will be 18 or 20 years for the underwood. Meanwhile, the guards go in and cut back the underwood to preserve the more valuable trees, and after 18 years the underwood will be cut and the standards left. All the ash is cut back except a few exceptionally vigorous plants. After cutting back, the shoot is very much more vigorous. The larch was protected from rabbits by little guards of folded felt. This young plantation gained the admiration of everyone present, who carried away a vivid picture of its extraordinary growth.

We then proceeded to the estate nursery, where the greatest care is taken that the root-system has a natural position. We were shown a kind of shears used to cut back the plants in the wood at two years old—between 15th March and 1st April—15 days before the sap begins to rise. Poplar suckers from the forest are transplanted into the nursery, kept for two years, and then cut back, and thus produce straight shoots. Both Abele and also

Picardy poplar (a variety of *P. alba*) are difficult to raise from cuttings. *Cerasus Virginiana* is a splendid American cherry for sandy soil. The nursery was well kept, and, like the woods, showed good care expended on it.

On leaving the nursery, we passed along an avenue where some of the trees appeared to have been planted in holes four or five feet across. The explanation was that they had been planted too deep, so the soil round the trees had been dug away, and the better aëration of the soil was seen by the leaders beginning to come away. We then came to a planting of Scotch pine on white sandy soil, looking exactly like Corsican pines. A very good crop of Scotch pine had previously occupied this white sandy soil, and was removed at the age of 42 years, being drawn out by the roots by means of the gear known as the "déracineuse Lobo," the root-extractor seen at the Liège Exhibition, and observed at work later in the day; afterwards the soil was dug to a depth of 15 inches by hand and planted very close with 40,000 plants per hectare (16,000 per acre). They will all be left on the land until the thinning. Planting costs 160 francs per hectare (£2 13s. 4d. per acre) without fencing. If it had not been for the rabbits, only one quarter of the plants would be required. The land was very clean, as the former crop of pine had killed all the weeds, and all the roots had been taken out. A planting-iron is used, like Dr. Schlich's, but just a little lighter and shorter. The planting-iron was 31 inches long, 11 inches in handle, iron 7 inches by 5 inches broad, and the part of iron up the shaft $3\frac{1}{2}$ inches, and thickest portion of iron $1\frac{1}{2}$ inches. A demonstration of its use was given by two of the guards, who were duly photographed. (Fig. 22).

We then passed into another adjacent wood on the northern slope with loamy soil, where a beech gave $10\frac{3}{4}$ feet girth at chest height, $58\frac{1}{2}$ feet high, and was valued at 45 francs per cubic metre (1s. 4d. per cubic foot solid). Mr. Marshall found it to be 30 inches quarter-girth over bark at five feet high. Mr. A. C. Forbes estimated it to contain nearly 300 cubic feet of timber. The tree was supposed to be 150 years old. This group of beech in a

Fig. 22—Demonstration in planting Scotch Pine, 16,000 plants per acre, at Chenoy.

Fig. 23—Mr. Crahay (with the President on his right) giving a lecture at Chenoy.

Fig. 24—Young Scotch Pine wood which had been pruned.

Fig. 25—The dining-room of the Abbaye de Villers.

coppice-with-standards was wrongly placed; oak is much the best standard, as the beech kills the underwood. Now the beech is cut out and oak is favoured as much as possible, and it grows well. Beech should be in high forest.

One of the finest oaks was then seen here, it measured eight feet girth, and contained 150 cubic feet (Mr. Havelock), 24¾ inches quarter girth at five feet and 50 feet high. The volume was given us as six cubic metres (210 feet solid), and its value estimated at 100 francs per cubic metre, which gives £25 for the whole tree, or nearly 3s. per solid cubic foot, without counting the branches. (Fig. 23). We sat down beneath its shade, and Mr. Crahay gave a further discourse. When there are very many standards, it is called standards-over-coppice—*futaie-sur-taillis*. In the felling area, whenever possible, he cuts out beech, which will not allow oaks to come up. He favours the oak, and keeps the beech back. He has had eleven years management of the woodland, and before his time the beech were allowed to grow. He cut 7½ acres of underwood from this area in 1901. The value of the underwood is only £2 8s. od. to £3 4s. od. per acre. The custom is to cut underwood one year, and the standards the next year; this secures a better price for the latter, as the merchants can come in and see them much better. The whole of the standards are sold by public auction, and very little damage is done to the underwood in taking them out. The timber is usually sold in small lots by ordinary auction. In the woods belonging to the State the method of Dutch auction is adopted, the trees being put up at an excessive price, which is gradually reduced until someone bids. The underwood is cut by the management, and the converted produce then is sold. This underwood fetched 300 francs (£12 10s. od.) per three hectares (7½ acres). The standards yielded 5,600 cubic feet for the three hectares (£275), or nearly £40 per acre, mostly beech being cut. The reserves are (1) *anciens*; (2) *modernes*; (3) *baliveaux*. The *anciens* are those standards over 1·50 m. (4¾ feet) girth; *modernes* ·75 to ·50 m. (29 to 20 inches) girth; *baliveaux* under 20 inches. We noticed all three grades, and some fine saplings, or tellers, about 12 years old.

Reserves per Hectare.

	Anciens. Average girth 6½ feet	Modernes. Average girth 4¼ feet	Baliveaux. Average girth 2½ feet	Brins. Saplings	Total
Oak and ash	4	2	16	0	22
Beech	7	15	38	12	72
Others (sallow and white poplar)	3	10	31 (planted birch and poplar)	0	44
	14	27	85	12	138

Total 138, or 55 per acre.

There are not enough natural seedlings of standards owing to the dense cover, so 500 ash have been planted, about 10 feet high, and a few elm where there was plenty of light. The elms are also planted along the borders to give shelter. 200 to 240 saplings per acre have been planted. White poplar is put in wherever there is some shelter. It fetches 40 francs per cubic metre (11d. per cubic foot solid). An immense amount of sycamore is produced naturally by seed, and this is mostly cut back to form underwood, and so very little planting of underwood is required. There are both sessile and pedunculate oak.

The railway freight to Brussels, 40 kilometres, costs 2·60 francs per 1,000 kilos., i.e., for 25 miles 1d. per ton per mile. For cartage, four miles, the same amount is paid as for the rail journey.

We then passed on through a young Scotch pine wood, which elicited the remark that "you may prune Scotch pine, but must not prune spruce." There are three reasons, (1) it does no sylvicultural damage, (2) in order to shoot rabbits you must prune, and (3) in making the thinnings after pruning you can see what you are going to cut out. Pruning costs 6s. 8d. to 8s. 4d. per acre, and the cost of it is recovered by the sale of the produce. No pruning is done as long as any heather is on the ground; trees adjoining the roads are, however, carefully pruned at once to prevent fire. (Fig. 24).

We had spent a most instructive and delightful morning, and were, therefore, ready for lunch when we returned to the restaurant, which had been the old Mill of the Abbey, and was called the Abbaye de Villers. Even in the large dining-room we

Fig. 26—Scotch Pine wood on very poor land at Chenoy.

Fig. 27—Birch Plantation at Chenoy.

Fig. 28—White Poplars at Chenoy.

Fig. 29—Scotch Pine wood being cleared by the root extractor "Lobo."

could admire the splendid oak beams of the ceiling, and Mr. Marshall and Mr. Margerison mounted on chairs on the table to measure them. (Fig. 25.) They were 19 inches by 13½ inches, and 39 feet long in the room without allowing for anything in the walls. Mr. Margerison said it was some of the finest oak scantling he had ever seen. There were two bearers at each end on corbels to help in the support, and the beams were perfectly clear of sap-wood. Seventy-one cubic feet, and 10s. per cubic foot, would not be far off their content and value. We also saw a piece of oak wainscot in a lobby, with very beautiful figuring, some of the finest ever seen by Mr. Miles and Mr. Richardson, who drew the members' attention to it. This restaurant had been built by the State and was let to the manager.

After lunch, some of the party visited the ruins of the Abbey, and the rest, piloted by Mr. Crahay, went to see another part of the woods. We entered a Scotch pine wood, and rested while Mr. Crahay again discoursed on its treatment. (Fig. 26). The first thing to notice is the successive folds of strata, covered by sand or loam; on the south and west aspects, and on the plateau, very dry and sandy. In these two situations nothing is to be hoped for except pine, with a short rotation of 45 years. The first thinning is done at ten years, when dead branches and suppressed stems are removed. The produce is just saleable, and that is all. Standing crops of pine, 45 years old, have been sold for 5,000 and 5,500 francs per hectare (£83 6s. 8d. to £91 13s. 4d. per acre) for pit-timber. Thinnings are made every three years; the yield of three thinnings at these intervals is 100 cubic metres per hectare (1,400 feet solid per acre). The final felling is 250 to 300 cubic metres per hectare (3,500 to 4,200 cubic feet per acre). This could not possibly be converted into coppice-with-standards, as the soil is too poor. The soil of this wood was trenched, because of an iron pan 16 to 40 inches below the surface, which prevents the water from getting away in the winter.

The epicormic branches of oak, etc., are pruned by means of ladders as much as possible, though climbing-irons are used on the coarse barked oak, but not on the beech. A very fine ash was seen in the hardwood section, 7¾ feet girth, 4½ cubic metres solid contents (157½ cubic feet solid). The poplars sell at the same price as beech. A very fine oak was then noticed

(*Q. pedunculata*), 11 feet girth at five feet, no dead branches, very vigorous, 33 feet in timber height, 34 inches over and 31 inches under bark (quarter girth). Several poplars more than six feet in girth were seen. We then saw a birch plantation. (Fig. 27). Birch used to be planted before Mr. Crahay came, and we could see it would give no good results—a lot of branchy birch is produced of no value, yielding no shade, and not destroying any heather. Wherever there is heather, the soil is too sour for beech. This was a striking example of the former management to contrast with the present improvement of new areas under Mr. Crahay's management.

We saw a fine example where after nine years growth of underwood, the standards fetched £50 per acre, and a good crop of hardwoods was left on good soil with a north aspect. We saw poplars planted by Mr. Crahay eleven years ago, and now 36 inches in girth, and some others 40 years old, 100 feet high and 6 feet 6 inches in girth. (Fig. 28).

We then came to a plantation of Scotch pine on the south aspect, one year old, planted this spring, after the former crop had been felled and the roots extracted by the "déracineuse Lobo." (Figs. 29, 30, 31, 32).

A demonstration was kindly arranged for our benefit, and we saw the machine at work in the adjoining area. 1½ feet more is obtained in the length of the butt, besides the roots. It is quite a new implement, and has been in use this year only. The operation costs 4d. per tree. There were 16,700 trees, 45 years old, per hectare. On the old system, it cost 370 francs for felling and 200 francs for digging up the stumps, making a total of 570 francs. By the new system the cost was 548 francs, and 30 francs are allowed for depreciation of machine.* Afterwards the land is ploughed at an expense of 50 francs; total, 628 francs. This makes it more expensive by 58 francs (628 *versus* 570). The gain is on the wood, which amounts to 50 cubic metres more per hectare (700 cubic feet solid per acre), valued at £10 per acre. There is certainly a benefit in the use of the extractor of £6 13s. 4d.

*See pamphlet on "la déracineuse Lobo."

Fig. 30—A demonstration with the "Lobo."

Fig. 31—The same.

Fig. 32—The roots drawn out.

to £8 16s. 8d. per acre. Moreover, planting can be done at once, instead of waiting till the Hylobius (pine weevil) has disappeared. On a clay soil the tap-root does not go so deep, but the extractor does just as good work. On the area cleared in this way nice young seedlings were observed to be coming up naturally, but they prefer to plough the land and plant artificially for the next crop. There were 250 acres of Scottish pine where the "Lobo" was at work.

The machine is a gear of three legs on slides, by which it can be moved from tree to tree; also a system of pulleys and chains with toothed apparatus to be driven into the base of each tree; It takes six men to work it. Two men guide the falling tree with ropes, so that it falls where they wish. A *pourboire* was given to the men who operated, and this completed the day's programme, which throughout had been highly interesting.

On our journey back to Brussels by train we saw an extensive area of glass-houses, there being between Ottignies and Hoeylaert 500 acres of glass-houses. Grapes are grown all the year round, and they are sent to England, France and Germany.

Later on we dined together at the Grand Hotel Britannique, and Mr. Crahay was the guest of the Society. The PRESIDENT in proposing his health said that Mr. Crahay had been kindly appointed by the Belgian Forestry Department to accompany the Society, and he added:

"I am sure Mr. Dubois could not have made a better selection from among the seventy officers of the Department, and we have seen what excellent officers they are; we have met several of them, and I am sure that no one does more for sylviculture than Mr. Crahay. We have seen at Rochefort with what success those bare hillsides have been planted with Austrian pine, and we have seen the stored coppice and pine woods he manages so splendidly for Mr. Boel, who is unfortunately too ill to be present with us. We ask Mr. Crahay to convey our grateful thanks to Mr. Boel. We have to remember that until Mr. Crahay came to Chenoy, the forest was not better managed than many in England. A more magnificent exhibition of beech, ash and oak we have never seen. The kindness and courtesy which Mr. Crahay has shown, we feel we must recognise, and I ask his acceptance of this Salver from the members of the Royal English Arboricultural Society, as a slight token of our appreciation of his goodness and as a memento of our visit." (Cheers.)

Mr. Crahay said he regretted he could not speak English, and thought that he had not merited such kindness. He thanked the members with all his heart, and it had been a pleasure if he had shewn anything worth seeing. They had not in Belgium great forests such as the Society had seen in France and Germany. He hoped they would all visit Belgium again. (Cheers.)

FRIDAY, AUGUST 18th.

Forêt de Soignes—Area 10,210 acres.

We started at 7 a.m., in carriages, for the Forêt de Soignes, accompanied by Mr. Auguste Boccar, *Inspecteur des Eaux et Forêts*, Mr. Crahay, Mr. Grandfils and Mr. Wartigue. It was a beautiful day, as we drove along the avenue Louise, amid fine horse-chestnuts and araucarias, the latter about 30 years old. We soon came to the park of La Cambre, which has an area of 362 acres, and is used as a pleasure resort by the citizens. It is beautifully kept, comprising undulating lawns, ornamental pieces of water and groups of fine trees. We observed a curious beech with a rough bark, pedunculate oak covered with acorns, sweet chestnut and hornbeam in fruit. The park is leased to the City by the King and is in charge of the forest officers of the Forêt de Soignes, of which it is really a portion. The Forêt de Soignes formerly extended more to the south, but much of it has been cleared for agriculture. 15,000 acres were cleared in 1827, under the government of the Dutch, who sold 125,000 acres of forest belonging to the Belgian State for about two million pounds sterling. Since then, this land, formerly attached to the Forêt de Soignes, has become so poor that the present owners are obliged to plant it with Scotch pine. 10,000 acres of the forest were bought back again in 1846 by the Belgian government for £640,000. After the Battle of Waterloo, out of gratitude to Wellington, 5,000 acres of the forest were given to him. The Duke cut the timber down and converted the area into farms. The State has acquired it now. The estimated value of the present State forest is £1,000,000 sterling. It consists of 8,750 acres of beech high forest, 790 acres coppice-with-standards, 670 acres of conifers and is 290 to 420 feet above sea-level.

Fig. 33—The Forêt de Soignes. Natural regeneration of Beech.

Fig. 34—Natural regeneration with stag-headed Beech in background.

Fig. 35—One of the old trees of the *Tire-et-Aire* system.

The whole of the forest is on the Bruxellian sand, with beech and Scotch pine on the higher lands, and oak in the depressions. The larch flourishes when there is beech mixed with it, this being the best mixture for larch. The road we traversed in the avenue of Lorraine was planted on either side with copper beech, by order of the King. Some portions of the sandy road were treated with tar oil to lay the dust. The forest guards met us on the road—they always carry guns, except when they are working in the forest.

We descended from the carriages when we reached the working section of St. Hubert, a splendid high forest of beech. Mr. Boccar and Mr. Grandfils then kindly furnished the following information: We are now in a wood of pure beech about 100 to 105 years old. The whole crop has, up to the present time, been artificially reproduced, and has grown up on a sandy soil. The whole was managed up to 1886 by the *Tire-et-Aire* system of clear-cutting, leaving 8, 12 or 16 standards per acre, followed by artificial plantations. This system was started here by the Emperor Charles the Fifth of Germany. No thinnings were made. The selection system in vogue before had given rise to very inferior woods, because felling was done in the accessible places and the best trees were cut, so it was a great advance to have the *Tire-et-Aire* system. For a long time there was a rotation of 100 years. All the big trees now standing are the old reserves of that system, 100 years older than the rest of the wood. The character of the forest was such that the crop was left to itself, hardly anything being done in the way of tending, and this accounts for the wonderful height of the trees: 78 to 80 feet of bole and 136 to 150 feet in total height. More reserves were left than was usual in France, about 20 standards per acre to produce good timber. Owing to insufficient cover the results of natural regeneration were a thorough failure. Planting was necessary, as Belgium is more northerly than France, and seed-years are rare, and on the sandy soil the surface gets caked. The system does not give satisfaction, and selection felling will be resorted to, when only little gaps are made in the mature wood by the felling of a tree here and there, and natural regeneration is secured. The new working-plan, however, has not yet been made.

Some trees which were measured by the party gave from 9 to 17 inches quarter-girth, average about 14 inches. Thirty-

three trees in a quarter of an acre gave 7,600 cubic feet per acre. In referring to the value of the humus produced by the leaves of the beech, it was stated that the town of Nuremburg has Scotch pine only 10 feet high at 30 years old owing to the humus being removed from the forest for manure and litter. We saw some natural regeneration that was very good. (Figs. 33, 34.) One of the old trees of the *Tire-et-Aire* system contained 43 cubic metres (1,505 cubic feet solid) 28 inches quarter-girth over bark, age over 200 years. (Fig 35.) The average height of the trees in that section was 72 feet. One of the great objections to the old plan was that numbers of beech become stagheaded from insolation—that is an argument against the system; beech cannot stand being exposed to the sun all round. The crop will be regenerated naturally, the artificial system being abandoned. A species of *Senecio* in flower was much in evidence on the soil. A tree thrown by wind was 83 feet long, cut off at 8 inches diameter. Several trees were affected by *Cryptococcus fagi*, the felted beech-coccus. The only remedy tried is to cut out affected trees in the thinnings. Where the woods are too crowded the disease occurs, and it is kept down by removal of the diseased trees. The old system of never making thinnings favoured the disease, but it has largely disappeared under the present management. There are still over 3,000 acres left worked by the clear-cutting system. (Fig. 36).

We then proceeded to the Avenue de St. Hubert, where the crop was 38 to 40 years old, and we once more heard the strains of the forest orchestra from the invisible guards who accompanied us. Here the reproduction had been entirely artificial, and is still carried on. In a forest like this, clear-cutting produces large gaps, which are extremely ugly near a town. The beech is frozen year after year, and there is the greatest difficulty in getting up new stock, so that natural regeneration under a shelterwood is evidently the right plan. There is a desire to give up clear-cutting, and to favour the group system introduced from Bavaria and the Grand Duchy of Baden—to cut out small groups here and there and let young trees come up along their margins naturally, and allow the groups to run into one another. There are larch here with beech, and they grow very well. Cleanings are made when necessary, cutting out willows, birch and sallow, and the first thinnings come

Fig. 36—Forêt de Soignes. A Beech Wood in St. Hubert.

Fig. 37—Experimental Thinnings, Forêt de Soignes.

at thirty years. At first the birch and sallow are extremely useful as nurses, and should not be cut out too soon.

Some sections devoted to experiments in different modes of thinning were then traversed. There are seven different experimental plots about one acre each of pole-wood, planted in 1867 with five years' old plants; height of trees about 60 feet. These plots are: (1) an untouched plot; (2) thinnings very light, nothing cut except dead and dying stems and suppressed stems; (3) thinnings from below, the suppressed stems being all cut out; (4) thinnings from above, suppressed stems being left standing, and those trees only, that interfere with the best grown, cut from above—both 3 and 4 are moderate thinnings (Fig. 37); (5) heavy thinnings as in 3 in the lower stage; (6) heavy thinnings as in 4 from above; (7) a special kind of thinning—*eclaircie belge*, "Belgian thinning,"—which consists in selecting the finest poles in the crop and marking them with a ring of paint. The officer cuts whatever is injuring the growth of the marked poles, and makes the cuttings, with reference to these alone.

In 2 and 3 grass develops, and the humus in the soil is lessened. There is more humus in 3. In 4 the superfluous dominant trees are removed. In No. 7 there were left 326 marked trees per hectare (133 per acre), together with everything which was not injuring them, whether it was in the upper or lower stages.

As some woodmen are in the habit of cuting everything down but the best trees, the forest officer marks all poles that should be kept. Thinnings are made every six years in young woods, but later on only every ten years. Every six years they revise the selection. The oaks grow as fast as the beech up to 40 years, but after that the oak must be freed.

The annual increment in the different sections are as follows:—

	Per hectare.		Per acre.
No. 1.	4 cubic metres	...	56 cubic feet
2.	3·71 „	..	52 „
3.	6·0 „	...	84 „
4.	6·7 „	...	94 „
5.	5·56 „	...	78 „
6.	5·85 „	...	82 „
7.	7·7 „	...	107·8 „

In No. 7, 1375 inferior trees were left, while the number of best trees left was 326; total, 1,700 per hectare (680 per acre), and the total number of cubic contents 192·4 cubic metres (6,734 solid cubic feet). Up to the present time the Belgium system shows the best result. One advantage is, the underwood is left as as much as possible, and thus the humus is preserved while only the best trees are set free. The underwood is left, except too near the best trees.

On observing the fine larch among the beech, the President said that at Cooper's Hill larch and beech are grown together with great success. A pure crop of larch can be left for 15 years, and should then be heavily thinned and beech introduced. Some of the larches measured in the experimental section (38 years old) 12¼ to 12¾ inches over bark at five feet up at 40 years, the height being 55 to 65 feet, or an average of 60 feet.

We then proceeded to the St. Hubert section of beech high forest, 140 years old. (Figs. 38, 39, 40). Some accurate measurements were made in 1900 of the crop; on one of the compartments of the section the volume was taken, and four years after it was again measured. The average growth per annum had been 10·5 cubic metres per hectare (147 solid cubic feet per annum per acre). There were 256 trees per hectare (100 per acre), measuring 709 cubic metres per hectare, or 10,000 cubic feet per acre solid, not including branches and tops: it was rather open wood. The average volume is 2·85 cubic metres for each tree (= 99¾ cubic feet solid), and, as in the Chiltern Hills, about 1s. 6d. per cubic foot is obtained for this class of tree. The value of the crop is 22,000 francs per hectare, or £352 per acre. There is no reason why there should not be a third of the crop in oak. One oak measured at 38 years old, 30 inches girth, and 60 feet high. The returns are 120 francs per acre (£4 16s.) annually for the best part. The average is half that, £2 8s. 0d.

Sir Hugh Beevor has kindly furnished the actual measurement from a ¼ acre of St. Hubert, average age 130 years. Trees per acre 132, average girth at 6 feet 4 feet 6¼ inches, height of bole 72 feet, height of tree 114 feet, volume of each, 66 feet cubic;

Fig. 38--St. Hubert Section. Beech 140 years old.

Fig. 39—The same.

volume per acre 8,700 cubic feet. This volume was from the sum of 33 measured trees, and it coincides with the estimate from an average tree. The taper from 6 to 36 feet in a fallen average tree was $7\frac{1}{2}$ inches from 53 inches, viz.: one seventh; getting this datum adds confidence to the estimate. It is evident from the tree height that hardly any top timber is included, and it is believed that 10,000 feet per acre is the sum of all measurable timber, though 9,500 is more likely. The soil of course accounts for this volume.

An oak was lying felled, and it was found to be badly ring-shaken. Its age was probably twice that of the beech crop, or about 250 years.

The President thought that the owner has every reason to fell oak before selling, as if he sells it standing to timber merchants only one half the proper price is offered. In Germany oaks are sometimes cut down the middle to show the quality of the whole bole. It is much better to fell the trees and use the inferior material for fencing, etc. The owner loses by selling bad material. The leaving of suppressed shadebearers is absolutely necessary with oaks, but is not necessary with beech, otherwise, with the former, the sun gets in too much.

The whole forest yields 500,000 francs per annum (£20,000), the expenses being £2,000 per annum for planting, roads, etc., without including supervision by the guards, which adds £1000 to the cost. Then there is the cost of the supervision by the forest officers. The gardes généraux receive £120 to £180, sub-inspectors £200, inspectors £320 per annum. The guards have a house provided, but the inspectors have not. The value of the hunting and sporting is not included, as it is kept for the King's own private use.

We passed along a fine avenue of beech where the quarternary sandy soil was full of pebbles of jasper, etc., like the southern drift above the Bagshot Sand, which extends to Salisbury Plain. (Fig. 41.) The principal game is roebuck and pheasants, and also rabbits, which the guards are allowed to ferret during the winter. The roes and rabbits do much damage. About 300 roebuck are killed every year in the forest. A good deal of timber is con

verted into planks in the wood in saw-mills. In clear-cutting, the defective and bad trees are felled first, and the rest in the following year. The felling area is divided into small lots of the value of £120 to £160 each, so that men with little means can buy them. They are sawn up on the spot to save carriage. The large pieces are used for making lock-gates, and the small stuff is converted into staves for small casks.

We then passed to the working section of Belle Etoile, where we saw two modifications of the clear-cutting system and subsequent planting. In the distance one compartment showed the standards left to the number of twenty per acre. We passed through a compartment in which no standards were left. (Fig. 42). Clear-cutting is to be continued here and the rotation to be raised to 160 years, and the use of standards is to be abandoned entirely, because they become stagheaded.

Scotch pine had been planted with other trees; the former are taken when one year old and lined out in a temporary nursery in the forest, and then planted. The men who plant receive 35 centimes per hour, and work about ten hours each day (3s. per day). The pines are planted as nurses, and the broadleaved trees are introduced afterwards.

The young larches are protected from rabbits by a folded piece of felt put round the base which costs 4 centimes (less than ½d.) The old system was to leave twenty standards per acre. At first, no planting was attempted for five years, until the ground became covered with blackthorn, birch and broom, which sheltered broadleaved species like beech, which would otherwise have been killed by frost; but now the ground is cleared entirely, and planting nurses of pine is the first operation. Here in this section 1,750 acres still remain under clear-cutting, but the rotation is raised to 160 years.

A question as to the future management of this crop now arises. Are they to let the conifers grow up to a certain age and then to introduce broadleaved species, or should the latter be planted at once?

It cost £8 per acre, owing to damage by game and exposure, to get this place stocked. There was a great drought last year, and many oaks and beech were killed. All over the forest they make temporary nurseries. The oaks are sown, and the conifers are transplanted one year old from the seed-bed.

Fig. 40—In St. Hubert. Beech 140 years old.

Fig. 41—A Beech Avenue in the Forêt de Soignes.

A magnificent oak had been left unfelled in this section, the "Oak of Bruyn," which measured in girth 11¼ feet (31 inches quarter-girth over bark); its height was 66 feet, and its volume 425 solid cubic feet; its value being £75. (Fig. 43.) In the next plantation the trees, Scotch pine and beech, were planted in alternate rows, the result not being very successful. A little further on, in a hollow around a magnificent beech, seats had been prepared for an al fresco luncheon of beer and sandwiches in the forest. The beech, (Fig. 44, to left of white tree) known as the "Visart beech," was a splendid tree, its girth being 12½ feet (37½ inches quarter girth), timber height 70 feet, volume 580 solid cubic feet, or about 440 cubic feet (English measurement). Mr. Boccar, Mr. Crahay, Mr. Grandfils, and Mr. Wartigue, were fittingly photographed at the base of the mammoth. (Fig. 45.)

We were then shown an interesting collection of beech timber, of which the various uses according to the different sizes were explained by Mr. Crahay. (1) "*Fagot du boulanger*," baker's faggots—firewood—12s. 6d. per 100 in the forest, made up of four pieces of split beech. (2) "*Fagot ordinaire*," small faggots, 10s. per 100. (3) "*La demi-lune*," very hard blocks, split in half for making backs of brushes, and chairs, 12 inches in diameter, 3 feet 3 inches in length, sold at 10s. for 35 cubic feet (3½d. per solid cubic foot). (4) Railway-sleepers, "*billes*," 3s. 4d. per bille delivered at a railway-station, 3½ cubic feet in each. (5) "*Bloc de verrerie*," 21 inches long, 19 inches in diameter, blocks for moulding glass bottles, for which purpose the wood must be of the best quality. No beech with the slightest defect in the centre, or with red heart, would be taken. 8s. per running metre the half block, or 45s. per 35 cubic feet (1s. 3½d. per solid cubic foot). (6) "*Petit merrain*," split-wood, dressed afterwards, 19 inches by 4½ inches and 10 inches by 4½ inches, used for small butter-casks, etc., 2s. 6d. per 100. (7) "*Bois de sciage*," planks (1) inferior quality, used for chairs, 9 inches by 12 inches to 13 inches —(*a*) 1 inch thick; (*b*) 2 inches thick; 13s. 4d. to 15s. per 100 running feet; a certain proportion of each thickness has to be taken. (2) first quality:—scantling used for staircases, and for furniture that is to be veneered, 12 inches by 2 inches, at 26s. 6d. per 100 running feet, which works out to 3d. per superficial foot; very cheap for the quality according to the estimate of several members. Also

timber for portions of lock-gates, "*batardeau*," 60s. for 35 cubic feet (1s. 8d. per cubic foot solid). We observed around this resting-place beautiful natural regeneration of oak and hornbeam, so that it is a pity that clear-cutting is resorted to.

Some members asked what tariff was imposed on foreign timber, and it was stated to be 1 franc per stère (35 cubic feet) on round timber and 2 francs on squared planks, 6 francs to 9 francs on planed; this is equal to one-third of a penny per cubic foot. On our way, after luncheon, we saw caterpillars of *Lophyrus pini*, the pine Sawfly of the second generation, attacking the needles of young Scotch pine. Some trees nearest the wood we saw had been sun-blistered.

In our drive on the way to Groenendael, we passed another wood where the nurses of birch, sallow and willow, which spring up naturally after a clearing, were used instead of artificially planted pine. Care must be taken as to the time of cutting out the birch, and they must not be left too long. Oak was plentiful among these nurses.

In the Groenendael section, we saw a pine plantation of the age of forty years, among which beech underwood was introduced at the last thinning, when the pines were thirty-four years old. The growth of beech was very good. After the pines have been cut, there remains a beech wood managed under the selection system. Sometimes they get frost as late as the 20th of June, which injures the beech foliage.

We then entered the Arboretum of Groenendael, which was started in 1897, and is about eight acres in extent. The land is divided into plots, 30 feet square, each containing a single species. A little path runs between each plot which has its own ticket with the Latin and French name of the species.. Beside the principal crop, wherever the species is light-demanding, a shadebearer is also planted to cover the ground. The plants when put in were 1½ feet high, and are now 4 to 8 and 9 feet high. The blue (Colorado) Douglas freezes here. The Oregon (Pacific) variety is much taller. The President said: "My experience is that the Pacific Douglas grows much faster than the Colorado, but it does not lignify in the autumn and sometimes frosts affect it, if these occur early in autumn; it forms two shoots in the year. The Colorado shoots earlier in the spring, and suffers from spring

Fig. 42—Clear Cutting and Planting in Belle Etoile.

Fig. 43—The "Oak of Bruyn" in Belle Etoile.

frosts on high plateaux. In the North of England, the Pacific will freeze, but in the South, the Colorado is frozen."

Picea omorika from Servia was especially noticed. It is a tall and slender mountain spruce, said to have been used for the masts of Venetian ships. It has now been almost exterminated, though the name, *omorika*, is known everywhere along the Danube. The Menzies Spruce was tall and doing well, and had really a splendid growth. The Japanese larch also was very healthy, and 20 feet high. In the experimental nursery were some interesting plots, where the ground was covered with various materials, and the effect on the growth of the species noted. These were bare soil, farm-yard manure, forest humus, dead leaves, moss (which showed a very good result) and straw. Also the effect of the exposure to sun of the young roots of trees for varying times as they might be in planting was compared, *e.g.*, for one hour, and another lot for one day and one night. Another experiment was as to the effect of cutting coppice close to the ground, which had not done so well as that cut four inches from the surface. Cuttings of poplar, and white alder transplants taken from the forest, also black thorn, are used between the beds to shelter the seedlings.

There were altogether 320 species of trees growing in the arboretum—a full catalogue of which was distributed among the members. 60 species and varieties of poplar have been planted.

We then returned to the Groenendael Restaurant, and had luncheon with the officers in the open air, surrounded by magnificent foliage, the trees being adorned with flags, the Union Jack and the Belgian flag hung side by side behind the President's chair. An excellent luncheon was served, and champagne was provided through the generosity of the Belgian officers. At the conclusion, the PRESIDENT proposed the toast of the King of the Belgians, saying that His Majesty loved the forests, and had done a great deal for the Forest of Soignes, where we had seen such colossal trees.

Mr. CRAHAY then proposed the health of King Edward in an eloquent speech, in the course of which he said, "those who love trees love their country, and therefore their king."

Mr. B. COWAN, Vice-President, in appropriate and eloquent

terms proposed the toast of the Belgian Forest Administration. He said :—

"The Meeting in Belgium has excelled all previous ones. We hope we are not an ungrateful people, and I am endorsing the sentiments of the whole of the members in saying that our deepest thanks are due to the Belgian Government. We are sorry Mr. Dubois is unable to be present, We have to thank Mr. Crahay for his unfailing courtesy throughout the week, and also Mr. Boccar, Mr. Grandfils, Mr. Wartigue, Mr. Brichet, and Mr. Noel : and I must not forget the guards."

Mr. Boccar replied to the toast, which was received with the greatest enthusiasm. Songs were rendered by Messrs. Leslie Wood, Whitmore, Crahay, Currie, Sewell and Havelock, while the forest guards, who had enlivened the luncheon by strains of music, and had accompanied the Society as an invisible orchestra throughout the tour, received an ovation for singing the Belgian forest song, and one of them rendered a tenor solo. The PRESIDENT, having previously sent a telegram to Mr. Dubois, the Director General of forests, regretting his being too unwell to be present, received the following reply, which he read :—

"*Remercie beaucoup Messieurs President et membres Sociéte forestière Anglaise, et regrette vivement ne pouvoir les accompagner.*"—Dubois, Directeur General."

Mr. GULLACHSEN, in an enthusiastic speech, said that the thanks of the members were greatly due to the labours of the President, who had made the tour a gigantic success, and that it would be memorable in the history of the Society.

The PRESIDENT thanked Mr. Gullachsen, and said :—

"I am pleased to see the members appreciate the work done in Belgium. The present excellent state of the forests in France was seen last year by some of us, and we cannot but admire the wonderful way in which the Belgians are striving to catch them up. At Rochefort, we saw Limestone rocks where it is very difficult to grow anything, covered with pine forest growth, and now we have seen this splendid forest of Soignes, near the spot where the Belgians and English fought side by side a hundred years ago. As regards my share in the tour, I have been a forester since I was twenty-four, and I was taught at Nancy, and both in Belgium and France I meet men who have also learned forestry at Nancy. I will therefore conclude by asking you to drink the health of the Forest School of Nancy, which has been the mother of foresters all over the world, and I propose we send a telegram of good wishes to the School." (Great cheers).

Fig. 44—The "Visart" beech in the background.

Fig. 45—Beneath the "Visart" beech.
Mr. Boccar, Mr. Crahay, Mr. Grandfils, and Mr. Wartigue.

A telegram was accordingly sent, signed by Messrs. Crahay, Grandfils, Fisher and Moir, all of whom are old Nancy students. A most friendly reply was received from Mr. Guyot, Director of the Nancy Forest School.

Before leaving the woods, our attention was drawn to a locust tree 19 inches quarter-girth, and a black walnut 24 inches quarter-girth. We then drove through an avenue of beeches which were sun-scorched, and were about to be felled. We passed a wood of beeches 110 years old, which still showed the regular lines in which they had been originally planted. A chestnut coppice in seven years old rotation was seen which will realise £11 per acre for cask-hoops. A clearing is made in four years and the crooked branches cut out.

During their occupation the Spaniards had destroyed the forests. The Austrians managed the forests well and planted considerably —the pine woods, 140 years old, were planted by them. Napoleon the First cut out all the oak in the Forest of Soignes, and planted 250 acres of pure oak instead, which is now to be underplanted with beech. The Dutch, after 1815, sold the Belgian State forests. King Leopold I. always valued forests and caused the State to buy them back whenever possible, and Leopold II. has also followed this policy.

SATURDAY, AUGUST 19TH.

Domain of Tervueren.

On Friday evening a number of the party had unfortunately to leave, including Sir Hugh Beevor, Mr. George Marshall, and Mr. C. Graham ; but about fifty availed themselves of a supplementary excursion arranged by Mr. Dubois and Prof. C. Bommer to the King's Domain of Tervueren and the Arboretum in charge of Mr. Bommer. The Domain of Tervueren is 900 acres, and there are included 72 acres of the Domaine Ravenstein.

We passed in the train through a portion of the Forest of Soignes, containing 453 cubic metres per hectare (6,340 cubic feet solid per acre) of timber, the trees of which had been planted 15 feet apart by the Austrians in 1790; and had never been thinned. There are 124 trees per acre. Their mean diameter

is 16 inches, and their timber height 55 feet, and total height 94 feet. We noticed they were not so high as the rest of the forest, where closer planting had been carried out.

The Arboretum of Tervueren was given by the King. The planting of it was begun in 1892, and mostly under small oak standards. The area of the Arboretum is 75 acres. The trees are arranged according to their geographical distribution. We first passed a plantation of two acres made in 1880, on a good beech soil, from which the beech had been taken; the crop now consists of pedunculate and red oak, the latter having nearly killed out the former, though planted in equal numbers, after 25 years' growth. In 1891, after eleven years, there were 1194 plants of pedunculate oak; in 1901 only 50 were left. One thinning has been made since then, and there are now 770 red oaks and 11 pedunculate oaks on the ground. The height of the red oak is now about 40 feet, and the girth 20 inches at chest-height. The soil is the Bruxellian Sand. *Q. rubra* is specially good on sandy soil.

Another plantation, mostly beech, was 42 to 45 years old, except for the old standards. The whole was planted artificially, and the standards are 140 years old. At first the young trees are very crooked and ugly, but afterwards they begin to straighten out. Every wood we had seen had this appearance at first. An oak of the *Tire-et-Aire* system measured 10 feet 2 inches in girth, and 60 feet in the bole. We again noticed some fine larch growing with the beech. When we came to a crop of pure larch they looked very poor in comparison, while some larch of the group growing nearest the beech were evidently doing the best. These were 34 inches girth at chest-height, at 40 years.

The Arboretum of Tervueren is divided into two sections with a depression between. On the right were planted the trees of the Pacific region, and on the left the trees of the Atlantic region. Very clear notice-boards show the method of arrangement. We thus saw the trees of the Pacific coast of America grouped, starting with those found in the North and proceeding to those of the South. As in Groenendael, the *Tsuga mertensiana* (Albert hemlock-spruce) was doing very well; it requires a moist soil *Picea alba* was mixed with *Picea rubra*, the former of which Mr. Bommer says can be recognised by its pole-cat odour.

A Colorado Douglas was observed bearing cones with recurved bracts, and generally of a brighter colour than cones of the Pacific variety. The intention is to plant also among the trees herbaceous plants and shrubs belonging to each particular region. A very fine *Larix americana pendula*, which requires moist soil, was seen, as well as *Abies cephalonica var apollinis*, which in Greece is cut like willows and coppiced, an unusual treatment for a conifer. A fine specimen of *Picea omorika* was noticed, as at Groenendael. (Fig. 46.) An interesting spot was that devoted to the tree flora of Japan. The Japanese framed Ordinances regulating their woods in A.D. 274. *Cryptomeria Japonica*, their commonest forest tree; *Chamaecyparis (Cupressus) obtusa*, a sacred tree; *Chamaecyperis (Cupressus) pisifera; Cupressus dolobrata; Sciadopitys verticillata*, formed a group representing one of the rare types of Japanese forests. These trees are named the "five trees of Keso." We saw some damage by the canker *Nectria ditissima*, which had followed the beech-blight, *Cryptococcus fagi*. A deciduous cypress very nearly 80 feet high, a handsome tree, was much admired. We should have required several days to thoroughly inspect this magnificent Arboretum, but saw sufficient to conclude that it will be one of the most interesting and attractive in the world on account of its geographical arrangement.

We then passed to the Tervueren Park, planted by the Prince of Orange in 1820, during the Dutch rule, along a fine avenue of horse-chestnuts and clean straight elms.

We lunched at the Restaurant Tervueren, and Mr. Bommer, in a few words, welcomed the party, and mentioned what a great debt was owing to English travellers for the possibility of making collections of exotic trees.

The PRESIDENT replied, and said: "We had not got in England such a magnificent arboretum of 75 acres planted to show the forest trees of the different parts of the world. This was due to the public spirit of the King of the Belgians."

Mr. CRAHAY, in a few words of farewell to the members whom he had accompanied throughout the week, said he thanked them for visiting Belgium, and would say in conclusion, "*Au revoir en*

Belgique." (Loud Cheers.) (Fig. 47, the last strains of the forest guards.)

We then returned to Brussels, and in the afternoon Mr. Bommer kindly conducted the party through the Botanical Gardens and Forestry Museum. The latter is splendidly arranged. There are five sections: timber, pathology, sylviculture, technology, and collections for industrial purposes. The specimens of timber were well shown; exhibiting bark, and cross, tangential and radial sections of the timber. There were models to show the volume produced by individual trees according to the system of high forest and coppice-with-standards. For example, a pedunculate oak produced a larger volume in coppice-with-standards than another in high forest, although only half the age of the latter tree; both were grown on the sandy soil in the Forêt de Soignes. There was a fine block of *Sequoia gigantea*, 1350 years old, cut down in 1891, and on a radial longitudinal face, the annual rings had the chief historical events of important years printed, beginning with A.D. 568, date of the invasion of Italy by the Lombards, and ending with 1830, Independence of Belgium. There were also fine specimens of *Agaricus melleus* attacking beech in the Forêt de Soignes.

On Sunday afternoon, August 20th, Mr. Bommer kindly conducted the thirty still remaining members to the field of Waterloo, where several hours were spent in walking along the whole of the French lines and the allied positions, with visits to La Belle Alliance, La Haye Sainte and the Chateau of Goumont (not Hougomont). The whole land is under arable cultivation, and we walked amid the sheaves of oats which were being harvested, and among crops of sugar-beet. There has been very little alteration in the cultivation for the past 100 years. The only artistic monument is the wounded French Eagle erected last year. Very few parties could have seen the battlefield so thoroughly with such a competent guide as Mr. Bommer, and very few will have traversed the field without mounting to the top of the Lion Monument. Our sincere thanks are due to Mr. Bommer for being able to carry away such a vivid recollection of the events which happened on June 15th, 1815, in the neighbourhood of Mont St. Jean.

On Monday, the party journeyed by an early train to Antwerp, where the Cathedral, the picture galleries, and the fine Zoological

Fig. 46—*Picea omorika*—The Servian Spruce in the Arboretum of Tervueren.

Fig. 47—The last strains of the Forest Guards' chorus.

Gardens were visited. A smooth passage across to Harwich brought us back to English soil, and we dispersed from London, all satisfied that the Belgian tour had been one of the most instructive and enjoyable of the Summer Meetings of the Royal English Arboricultural Society.

Directly on his return to England, the PRESIDENT addressed the following letter to His Majesty the King of the Belgians in the name of the Society :—

COOPERS HILL,
ENGLEFIELD GREEN,
SURREY,
le 24 *Aout*, 1905.

A Sa Majesté le Roi Leopold II.

SIRE,

La Societé "The Royal English Arboricultural Society" a l'honneur de vous addresser bien respectueusement ses sincères remerciements pour l'autorisation si aimable, que vous avez bien voulu lui accorder de visiter votre beau domaine de Tervueren, que vous avez fort généreusement donné à l'Etat, et pour la bienveillante et généreuse réception que lui a été faite.

La visite à l' Arboretum en voie de création et des boisements effectués à Ravenstein, et à Tervueren, a cloturé dignement la grande excursion que soixante-dix membres de notre Société ont fait dans les forêts belges et notamment dans les beaux domaines de l'Etat, les forêts de Soignes et de Hertogenwald.

Nous nous permettons, Sire, de vous temoigner notre admiration pour les travaux si bien conçus et si bien exécutés sous votre impulsion, par les forestiers belges, qui travaillent ainsi, pour le plus grand bien de leur pays, de créer des riches massifs boisés exerçant une si heureuse influence sur la prospérité générale de la nation.

Nous rendons hommage à la science et à la haute compétence de Monsieur le Directeur General Dubois qui sait si bien imprimer à tout le service forestier une impulsion si remarquable et qu'il nous a été donné d' apprecier. Nous rendons, de même, hommage au dévouement, au zèle et à la science des agents forestiers avec lesquels nous avons été en relations pendant notre séjour en Belgique.

Nous ne voulons pas oublier les excellents brigadiers et gardes forestiers qui nous ont servi de guides dans les forêts belges et dont les travaux se font montrer de tout coté. Leur musique de cors de chasse nous suivait partout dans les forêts et se mélait aux verdures pour nous faire gouter les agréments de la vie foresterie.

La Société "The Royal English Arboricultural Society," a l'honneur de présenter à votre Majesté l'assurance de ses hommages les plus respectueux.

(Signed) W. R. FISHER,

Président de la Royal
English Arboricultural Society.

A letter of thanks was also sent to the Minister of Agriculture, at Brussels, for his kind permission to the Society, to visit the Belgian forests, and for having deputed Mr. Crahay to accompany the party.

NOTE.—The illustrations which accompany this Report are from photographs taken by Mr. S. Margerison, to whom the Society is greatly indebted, with the exception of Nos. 2, 3, 4, 5, 7, 8, 9, 13, 27, 33, 37, 38, 46, from photos by Mr. Smith Hill; and No. 10 from a photo by Mr. Fraser Story.

I.—THE LIFE HISTORY OF *PINUS SYLVESTRIS.*

By Dr. A. W. Borthwick, Royal Botanic Gardens, Edinburgh.

(*Awarded Gold Medal.*)

Distribution.

The Scots pine—one of our few indigenous conifers—has a very extensive geographical range occurring over a wider area than any of the other European species. No doubt the ability of the tree to withstand extremes of temperature—its limited demand for soil and air moisture, together with great adaptability to grow on poor soils, account to a large extent for this fact. It occurs in Eastern Siberia where the winter temperature falls to 40° C., and where the vegetative period lasts for only three months. On the other hand, it is found in places with a temperature of over 35° C., and where the winter rest is not more than three to four months. In Europe it stretches from the 37° North Latitude in Sierra Nevada to the 70° on the West Coast of Norway. In Asia it ranges from Siberia to Asia Minor, and is also found in Persia.

General Features (See Fig. 1).

The size and shape of the tree varies greatly, according to the locality and kind of soil in which it is growing, from a mere shrub to a stately tree of 100 to 120 feet in height. Given a good pine soil and a suitable climate, we see the tree at its best. At first it has a pyramidal form tapering towards the apex with branches arranged in regular tiers or whorls, but as the age of the tree

increases this regular habit is lost. The crown becomes broad and flat, or dome-shaped. The bark on the lower part of the trunk becomes thick and ridged, while at the apex it remains thin where the circular membranous scales peel off and leave a smooth reddish brown bark on stem-apex and branches, which forms a pleasing contrast to the dark green foliage. When grown in close canopy the trunk is clean and cylindrical with a very slight taper, and can be traced to the very top of the crown; whereas trees grown isolated are more branchy and the main stem soon loses itself in the crown.

The pine is a distinct light demander, and will thrive even under direct insolation, as its thick bark affords a sufficient protection against sun-scorching. It therefore thrives best in sunny situations, and is by no means tolerant of long continued fog or mist during its vegetative season. As regards soil, it is not very fastidious, but under no circumstances will it tolerate moor-pan. The soils best suited to the pine are those which contain a certain degree of moisture, but which are not too heavy or binding in character, such as sandy loams.

We will now proceed to investigate the vegetative and reproductive organs of the pine as regards their relation to each other and to the general life history of the tree.

The Buds.

If we examine the apex of the stem, or a side branch in winter, we find it is terminated by a large conical end-bud with the whorl buds, that is, a ring of three or more lateral buds at its base. They are all wrapped up in greyish red scale leaves with an additional cover of exuded resin. (See Fig. 2). The internal structure of these buds is readily made out in longitudinal section, where a central axis which bears the closely arranged scale leaves is seen. The axils of the scales, or the angles between them and their parent axis, are occupied by the young perfectly formed, though still rudimentary, bifoliar spurs. (See Fig. 3). If we examine a pine shoot about the beginning of May we find the apical and ring of whorl buds have begun to elongate. In Fig. 4 we have the shoot in its spring condition. With the elongation of the shoot the scale leaves are gradually thrown off from below upwards and the young bifoliar spurs become visible. Sometimes one or two of the whorl

buds remain dormant, that is, do not develop in the spring following their formation, and indeed such buds may remain latent for a considerable number of years, and are only forced to develop after severe damage to the green foliage of the tree by insects, frost or fungi. Such buds are of importance in the life history of the pine, since they act as a kind of reserve whereby new green leaves may be produced in cases of emergency. As a rule the shoots resulting from such sleeping buds retain their scale leaves, which become green and produce the so-called rosette shoots. This may be seen in young plants frequently after being disbudded by black game. However, on the normal shoot the leaves are always reduced to brown membranous scales, in whose axils the bifoliar spurs or branches of limited growth, which bear the two green needle-shaped leaves, are formed. They are well named "branches of limited growth," as they cease to grow at a very early period, but retain at their apex a very rudimentary cone of meristematic or growing tissue. This little rudimentary bud is placed between the two green leaves of the spur, and is therefore called an interfoliar bud. Like the dormant buds, they will only develop after severe damage to the foliage, or under the stimulus of a sudden excess of food material, such as may occur after severe thinning in a young plantation. A developing interfoliar bud may be seen in Fig. 2, between the two needles just below the terminal bud. We have thus in the pine, apical and whorl buds, dormant buds, bifoliar spur buds in the axils of the scale leaves, and interfoliar buds between the green leaves. Those all belong to the vegetative system of the tree, but we must not forget the flower buds. The flowers will be fully described later. Suffice it in the meantime to say that the male and female flowers are produced on separate parts of the plant. Some of the whorl buds instead of growing into branches of unlimited growth may produce female flowers (see Fig. 14), while the male flowers are developed from buds which replace those of the bifoliar spurs at the base of the annual shoot. (See Fig. 12).

The Shoot.

The branching of the pine is during youth distinctly monopodial. The young tree has therefore a very regular monocormic branch system which is entirely composed of the whorled branches of

unlimited growth arranged at regular intervals on the main stem; while the intervening branches, with few exceptions, develop into spur shoots or branches of limited growth. In spring, when vegetation commences, not only the end-buds of the main trunk and side branches, but also the whorl buds produce new shoots which to begin with assume a marked negative geotropic position. (See Figs. 4 and 28). The young twigs retain this position during their most active period of apical growth, but after this has ceased and internodal growth begins the whorl branches gradually curve away from the mother axis and assume their ultimate horizontal position. If the terminal bud of any shoot be destroyed it may be replaced by one of the whorl buds, or even one of the bifoliar spurs may shoot out into a branch of unlimited growth. When the tree has attained a certain height its branching becomes irregular on account of the whorl buds in mature trees producing side branches which develop more vigorously than the leaders, the main trunk becomes lost in the crown, and its lower lateral shoots as well as those of the stronger side branches die off for want of sufficient light, and the tree develops its typical umbrella-like crown. (See Fig. 1).

As we have already said, the main axis and the branches of unlimited growth in the pine bear under normal circumstances only brown membranous scale leaves. The green leaves are only formed on the branches of limited growth, which are in reality very minute side branches. At first they produce closely crowded scale leaves which form the sheath at the base of the green needles, and entirely hide the tiny shoot from view. This needle sheath can easily be made out at the base of the older needles in Fig. 4. The subsequent growth in thickness of the stem together with the appearance of the annual rings, and the structure of its wood element will be described later.

The Leaves.

The green assimilating needles of the Scotch pine are plano convex in transverse section, their inner or upper surfaces being flat while their outer sides are curved (see Fig. 1); thus when the two needles are placed face to face they form a complete cylinder.

The green leaf surface becomes visible about the end of May. The growth of the leaf is at first slower than that of the shoot,

but is continued for a much longer time; however, growth in length is finished in the first year. In the second and third year a certain increase in thickness may be observed. The mature needles are stiff and pointed, and sometimes slightly twisted. Their margins are very slightly serrated. The inner side is of a lighter green than the outer. They vary somewhat in length, being longer on the spurs of the main axis and principal branches than on those of the ultimate twigs. The pine needles have a radial structure and exhibit distinct xerophilous characters. The epidermal cells (see Fig. 6) are thick walled, with a well developed cuticle on the outer side. They are supported by a strongly developed hypoderm. The stomata occur on all sides, and are sunk in little pits which are filled with white plugs of wax. (See Fig. 6). Such arrangements, together with the small leaf surface. are intended to prevent excessive loss of water by transpiration, The stomata—each with its little plug of white wax—are arranged in parallel rows and form the fine white lines which are visible to the naked eye, especially on young newly formed leaves. These white striæ alternating with the dark green surface of the leaves impart to the foliage its characteristic bluish tinge. The green assimilating tissue of the leaf consists of plate-shaped cells with marked convolutions in their walls. Between them are large intercellular spaces which can be readily made out in a longitudinal section of the leaf. In this tissue occur the regularly arranged resin canals which run in a longitudinal direction. They vary in number from twelve to eighteen. The two marginal ones are the first to be formed, and they are connected below with the tissue of the branch, while the others appear at different heights and in varying numbers and end blindly both ways. All these resin canals abut on the hypoderm of the leaf. They are lined by from twelve to sixteen resin secreting cells, and are supported on the outside by one or two layers of strengthening sclerenchyma fibres. (See Fig. 6). The leaf is traversed by two veins or vascular bundles which are situated some distance apart. The wood portion or xylem part of the bundle is placed next the flat side of the needle, while the bast or phloem portion lies towards the convex side. Between xylem and phloem there is a small cambium zone which may add to the quantity of xylem in the bundle. The tissue between the

bundles is principally composed of sclerenchyma fibres. On their outer sides the bundles are surrounded with water-conducting or so-called transfusion tissue. This patch of transfusion tissue is to be seen in the interior of the section (Fig 5), oval in shape and lighter in colour than the surrounding green assimilating cells. On its outer limit is a well-marked endodermis.

The average life of the needle is three years, but if the shoot is growing slowly it may be prolonged to four or five. On old trees, however, two or three years is the average. The duration of the needles depends to a great extent upon the amount of light they receive. It may, however, be noted in passing that the needles remain longer on branches which for several successive years produce male flowers. Here one may find needles on eight or nine successive annual shoots. When the male flowers fall off they leave a naked place at the base of the shoot, and it would seem that the longer duration of the needles on the upper part of such shoots is a compensation for the loss of leaf surface thus occasioned. On the other hand, shoots which bear female flowers lose their needles early. The old needles which have become dry and brown are shed on the approach of winter, together with the spur-shoot which bears them. The defoliation in the pine is therefore a shedding of the branches of limited growth. The fallen needles contain 0·91 per cent of nitrogen and 1·4 per cent. of ash. The quantity of potassium and phosphoric acid is very much reduced as compared with that of the living needle ; while, on the other hand, the silicon and calcium is greatly increased.

The Scale-Leaves.

The scale-leaves are placed on the main stem according to a 5/13th phyllotaxis. Each scale of the annual shoot, with the exception of about the first dozen, bears in its axil a bifoliar-spur-bud, which develops in the same year as it is formed. These spur-shoots at first produce about ten scale-leaves which form the silvery sheath through which the young needles may be seen protruding in May. (See Figs 4, 14 and 47). The first two scale-leaves of the spur are placed right and left (they may be seen in Fig. 4 with the aid of a lens), while the next pair alternate in position with them. Further up they become longer with more expanded margins, while those which lie just below the

Fig. 5.

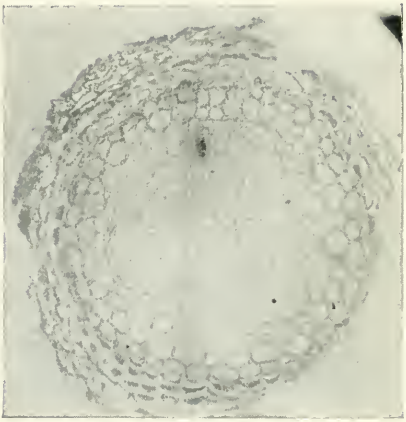


Fig. 9.

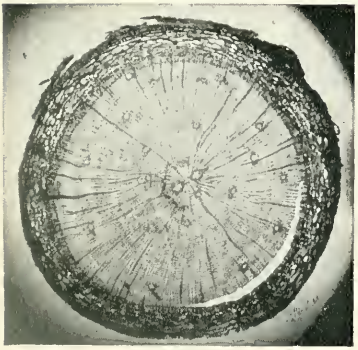


Fig. 10.

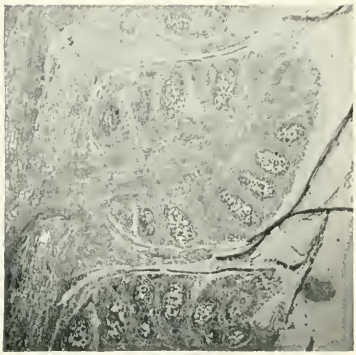


Fig. 13.

green needles are very thin and translucent. The scales of the buds are triangular, brown and membranous, with long, white fringes on their margins.

The cotyledons and primordial leaves will be described under seedling.

The Root.

With sufficient depth of soil the pine tree forms a deep sinking tap-root with wide spreading lateral branches. On the other hand, in shallow soils with a rocky substratum the root-system is of necessity superficial—hence on hill sides and on rocky places the tree is less storm proof than on the low ground, where a deeper soil usually prevails. This deep sinking and wide spreading root-system explains why the pine is able to grow on what might seem to be dry soil, since it can obtain moisture from the damper subjacent layers. While the root-system accommodates itself readily to shallow ground, still the best stems are formed on good, deep, porous soil. As regards the chemical composition of the soil, the pine tree is by no means exacting, and it can obtain sufficient food material where most other trees would fail. The physical properties of the soil are of more importance to the pine than its chemical composition.

Like many other trees, the pine possesses the power of forming fungus roots or mycorhizae. Opinion differs as to whether these mycorhizae are only found on certain kinds of soil. Some of the best authorities regard their occurrence in the pine as universal, and hold that the fungus roots are of the greatest importance in the life history, growth and cultivation of the tree ; whereas others believe that the pine tree on account of its wide spreading root-system is to a great extent independent of mycorhizae. Tubeuf found fungus roots present in moor soils, in forest humus, in rich loams and in well manured agricultural soils. The consensus of opinion seems to be that the mycorhizae may be developed in all classes of soil. In the root system of the pine we can distinguish long roots and short roots. The short thicker roots are the mycorhizae. (See Figs. 7 and 8). Some of these short fungus-bearing roots fork repeatedly, and in this way give rise to thick bunchy coral-like masses of closely packed rootlets. These forking mycorhizae are peculiar to the pine, and occur on the younger

portions of the long root. In spring or early summer, when root-growth is renewed, these short fungus roots dry up and fall off. At the same time some of the clumps may undergo secondary growth and become comparatively large. Sometimes hyphae radiate out from them into the surrounding humus, in which case the root has a thin layer of external or ectotrophic mycelium, but at the same time a certain portion of it may be inside the root or endotrophic. In the opinion of some authorities, the coral-like mycorhizae are similar structures to the root nodules of *Alnus*, *Myrica* and the *Elagnaceae*, and are able to fix free nitrogen like the root tubercles of the leguminosae.

The pine root begins growth in spring before the buds become active. It reaches its maximum in early summer and falls off in August or September, but shows a slight increase again before the approach of winter, when it finally ceases, although in mild climates and situations root-growth may continue throughout the winter. The best soil temperature for root-growth is between 5° and 6° C. Root-hairs may be present or absent on the short roots. In summer the colour of the roots is light brown, which, except at the tips, changes to a dark brown in winter. Figs. 9 and 10 shew in transverse section a one-year-old root and a five-year-old root. The young root is very highly magnified in order to show its structure. The tri-arch patch of xylem is seen in the centre. Portions of the cambium ring, which will give rise to secondary growth in thickness, are visible at the ends of the rays. The phloem or bast alternates in position with the xylem bars. Surrounding the xylem and phloem the cells of the cortex filled with starch grains are to be seen. The older cortical cells and epidermis is in process of being thrown off. The other section (Fig. 10) is of a root five years old. The secondary annual rings are plainly visible, as well as numerous medullary rays and resin canals. A layer of small-celled tissue into which the medullary rays extend surrounds the wood body. This is the phloem. It is bounded on the outside by the secondary cortex, and on its inner limit by the wood cambium.

Flower Production.

In the pine the flowers are unisexual, and are produced on different parts of the tree. Sometimes trees may be found which

bear only male flowers or female flowers as the case may be. The time of flower production depends upon the conditions under which the tree is grown. In isolated free standing specimens it usually begins about the fifteenth year; whereas in close woods it may be delayed till the thirtieth or fortieth year. Generally speaking, in trees, and in fact in all plants, when reproduction begins the vegetative activity either ceases or is very much reduced, hence by keeping the trees in close canopy the forester modifies the life history of the pine in such a way that the full vegetative activity is maintained for as long a period as possible, and this is just the object for which the trees are grown, that is, to obtain timber—the result of the vegetative functions rather than seed—the result of antagonistic reproductive functions.

On the whole, when seed-bearing begins the pine produces a comparatively large quantity of seed at regular intervals from three to five years according to the quality of the locality. The flowering time is usually about the end of May or beginning of June.

The Male Flower.

As we have already stated, the male flowers replace the bifoliar spurs at the base of the annual shoot. (See Figs. 11 and 12). A single male flower (Fig. 13) consists of sporophylls arranged on an oblique ascending axis. They are yellow in colour and ovate in form. Two pollen-sacs occur on the lower side of each sporophyll and when mature they split longitudinally to liberate the pollen, which is carried by the wind to the female flower. As a great quantity may be lost in transit enormous masses are produced by the numerous male flowers. Each pollen grain has two raised balloon-like portions of the outer coat to make it more buoyant. In the neighbourhood of extensive pine forests the large quantity of pollen liberated gives rise to the well-known sulphur showers.

The Female Flower.

Female flowers occur at the apex of the young shoot, and are developed from the whorl buds. They thus replace branches of unlimited growth. The whorl buds which produce female flowers behave differently from those which produce branches, in that they develop into flowers immediately; whereas the branch buds do not begin to develop until the following spring. (See Fig. 14).

These flowers are formed before the bifoliar spurs have begun to elongate. The pollen has therefore free access to them from all sides. The female flowers are spherical in form and quarter of an inch long. They may be bright red, reddish brown, or greyish brown in colour. At first they are upright in position and are composed of thin, circular bract-scales, and slightly shorter but more fleshy seed-scales with dark red pointed ends. (See Fig. 16). During the time of the pollen showers the axis elongates so that the scales become more separated, allowing the pollen free access to the two ovules which lie at the base of the seed-scales with their micropylar ends towards the axis. Just before pollination a little drop of fluid is secreted at the orifice. The pollen grains carried by the wind fall on the smooth upper surface of the scales and roll down into its axil. The pollen is directed towards the ovules by means of a ridge on the upper surface of the scale. On arriving at its destination it is caught in the drop of fluid at the micropyle of the ovule which then begins to dry up, and in so shrinking pulls the grain down towards the nucellus. After pollination the female flower increases to about the size of a pea, and becomes curved downwards on its stalk. (See Fig. 14). During these changes the seminiferous scales have become thicker and more woody, and the raised light brown rhomboidal apophyses with their cross ridges and central papillæ begin to form at the apices. With the increase in thickness the scales become closely pressed together and hair-like structures are formed on the parts in contact which fit into one another and fuse, thus the cone is completely closed for the protection of the ovules within. The growth of the bract-scale has in the meantime ceased completely, and it is no longer visible from the outside. In the autumn of the first year the young green cone is about one-third of an inch long and quarter-of-an inch thick, while the stalk is about half-an-inch in length. The one remains in this condition till the following spring. (See Fig. 15). The pollen grain which has lain dormant till now begins to germinate, and the pollen tube carries the male gamete which is formed in the process through the nucellus to the egg, and thus fertilisation is effected about a year after pollination. One of the results of the stimulus of fertilisation is to cause the seminiferous scales to increase in length and thickness. While the apophysis assumes its mature form the whole cone becomes

larger and more woody. (See Figs. 14, 15 and 17). While all this external development is going on important changes are taking place in the ovule. Fig. 18 shows a microphotograph of an ovule lying in the axil of its scale leaf. Its outer coat or integument is seen as a thick black line, except where it is attached to the scale. Inside this occurs a fairly broad mass of homogeneous tissue which towards the lower micropylar end has become detached from the tegument. This tissue is called the nucellus. Lying inside it we have the embryo sac, in which two oval-shaped bodies are seen at the lower end. These are called the corpuscula or archegonia,* inside each of which an egg is formed. After fertilisation the egg by a process of cell division gives rise to four embryos, only one of which, however, reaches maturity.

Fig. 19 shows a ripened cone in longitudinal section with the seeds which have been produced by the fertilised ovules seen in the axils of the scale-leaves. In the lower left-hand seed we can make out the embryo lying embedded in a white tissue, the endosperm, which is covered on the outside by the seed coat developed from the integument of the ovule. In the course of the following spring the cone opens as a result of the shrinkage through drying of the under side of the scales, which causes them to roll back and allow the seed to escape. (See Figs. 14, 15 and 17). This occurs principally during dry, east winds.

The Seed.

The seed varies from one-fifth to one-tenth of an inch in length. It has an elongated ovate form, and varies in colour from light brown to black. It possesses a brown membranous wing from one-half to three-quarters of an inch in length. (See Fig. 20). One side of the wing is straight, the other curved. It develops as an outgrowth from the integument of the ovule, and at first covers the seed on its outer and inner surface, but as this swells the outer and inner covering portions of the wing are ruptured, so that only lateral prongs are left from which the seed is easily detached. The seed and wing together weigh only a few milligrams—hence it is easily carried by the wind, and when falling descends in a

*Note.—As there are several archegonia we may get several fertilised eggs or zygotes, and each one may produce four embryos, but it is only the strongest embryo of the lot which survives.

screw-like manner with the tip pointing downwards. After flight the seed becomes free from the wing and is ready, if the conditions are favourable, to germinate. The germination per cent. of good commercial seed is on the average about seventy, that is, of every hundred seed sown seventy should germinate. As regards the effect of the climate and conditions under which the tree is grown on the quality of seed, opinion seems to differ, but there is no doubt that seed from the higher altitudes or Northern countries is more vigorous and shows a greater germination per cent. than seed from the low ground or warmer countries. The larger the seed the stronger and more vigorous are the seedlings. The best temperature for germination is between 17° and 20° C., while 7° is the minimum. On the other hand, temperature above the optimum, or sudden variations in temperature, have an injurious influence on germination. As regards the depth at which pine seed should be sown, it has been found that a third to a half-inch is ample. A covering of soil rich in humus has a favourable influence on germination by retaining a more equable temperature.

Let us now trace the life history of the pine from the mature embryo through its juvenile stages of growth. In Fig. 21 is shewn an embryo extracted from a mature seed. At its apex we have a whorl of five cotyledons or seed leaves which surround a tiny bud —not visible, however, in this photograph—called the plumule. Below the cotyledons the axis consists of hypocotyl and primary root. The primary root forms about the lower third of the axis. It is surrounded by a thick mucilaginous cover which acts as a kind of root-cap, and may be seen in the photograph surrounding the dark outline of the root. When germination begins, the primary root with its slimy covering protrudes from the seed through the micropyle and grows in a downward direction. At first root-hairs are not developed, and its gummy mucilaginous sheath serves to fix it firmly to the particles of soil. The two seedlings on the left of Fig. 22 show germination in this stage. The next two seedlings are further advanced, and we see the cotyledons expanding, but still covered by the seed coat which has been brought above the soil. During germination the cotyledons are actively absorbing the food or endosperm stored up in the seed. As a consequence their epidermis remains very thin and, if the seed-coat was suddenly thrown off, the seedling

would be in danger of drought through excessive transpiration, hence the seed-coat remains for some time as a protective covering to their delicate tips, and by keeping them closely bunched together the danger of excessive transpiration is reduced. Sometimes, as seen in the fourth seedling, the curved hypocotyl bent like a bow is the first part to appear above ground. This is due to the seed having been sown too deep or too firmly pressed down and held in the soil. The curved hypocotyl tends to straighten itself, and thus exerts a pull upon the cotyledons which are drawn out of the soil with or without the seed-coat attached. In the seedling on the right germination is complete. The seed-coat is thrown off and the cotyledons are expanded. In their midst we see the young plumule which will produce the future shoot beginning to grow.

The cotyledons are triangular in outline, about three-quarters of an inch long and usually show a sabre-like bend. Fig. 23 shows one in transverse section, very much enlarged. The epidermal cells are thin-walled, and the stomata are equally distributed on the two inner sides. They are sunk in pits, but have no white wax plugs—hence the cotyledons appear of a uniform light green colour. No stomata occur on the outer side, and there is no hypoderm below the epidermis. The assimilating mesophyll cells are thin-walled and round. In the middle of the section the vascular bundle is seen surrounded by transfusion tissue. Its wood body or xylem is towards the inner angle, that is, the upper side of the cotyledon. There are no resin canals.

In weak seedlings the plumule merely forms a terminal bud which rests till the next year, but in normal healthy plants it shoots out producing an axis bearing a number of spirally arranged primordial leaves which are lineal in form with pointed tips and finely serrated margins. The upper side is flattish, while the lower side is slightly convex. In anatomical structure (see Fig. 24) they differ from the adult needles, in that they have only one central vascular bundle, and there is scarcely any hypoderm below the delicate epidermis. There are only two resin canals on the under side of the leaf near the margins, and they have usually no sclerenchyma sheath. In very vigorous plants the primordial leaves may bear bifoliar spur buds in their axils. The growth in the first year usually ends with the formation of a terminal bud. In

the second year when the terminal bud recommences growth it produces an axis which again bears primordial leaves, but these are gradually transformed into brown scales, which are the only kind of leaves produced on the main axis from this time henceforth. The uppermost of these primary leaves and scales bear axillary buds which give rise to bifoliar spurs. The cotyledons dry up and wither during the first winter, but remain attached till spring. In the second year the stem may increase one or two inches in length. It finishes up its growth with the formation of an apical and two to three whorl buds which in the third year give rise to the first whorl of branches. Very vigorous plants may however produce their first whorls in the second year. From the third year onwards scale leaves only are formed on the main shoot and side branches. These scale leaves are placed on raised portions of cortical tissue, the so-called scale leaf cushions which give the ridged and furrowed character to the young pine twig. In the yearling and older plants sometimes buds may be formed in the axils of the primordial or scale leaves which develop into long branches, but these are usually weakly and do not bear bifoliar spurs unless the main stem be damaged, when they show a more vigorous growth, and sometimes bear spurs with three to five needles in the sheath. We have refrained from giving a fuller account of these juvenile stages of development as the series of photographs (Nos 25 to 28) illustrate the various points and speak for themselves.

A very important condition for the healthy development of the young plant is sufficient air and light, and in order to obtain these the growth at first is rapid. On the best soils five-year-old plants should show an average height of $2\frac{1}{2}$ to 3 feet, while at ten years the average height should be 6 to 7 feet. When planted in suitable situations at, say, four feet apart, complete canopy should be formed in the fifth or sixth year. On better class soils the period of most rapid growth in height lies between the tenth and twentieth year, but on the poorer soils it may be delayed till between the twentieth and thirtieth year. Growth in height ceases about the fiftieth year, when an average height of about 120 feet is attained. When height growth ceases the trees begin to form their spreading, umbrella-like crowns, and the wood tends to become open, but in favourable localities the canopy may remain closed till the sixtieth or seventieth. The pine has an age limit

Fig. 18.

Fig. 19.

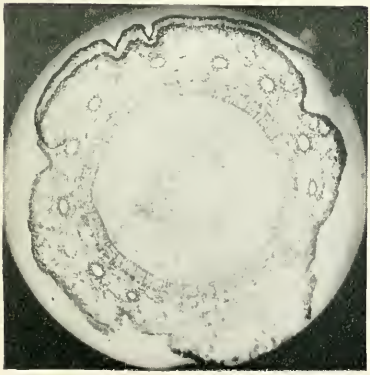


Fig. 29.

Fig. 30.

of several hundred years, and a maximum height of 150 feet. It is usually regenerated by planting, and in some cases by sowing after clear felling; but in certain localities, especially in the North of Scotland, its regeneration may take place naturally by seeding from above when the wood is sufficiently open, or by side seeding in strip fellings.

In order to complete our account of the life history of the pine we have still to trace the changes which take place in its stem during development, and to illustrate the structure and growth a series of photographs from Nature has been prepared. Starting then with Fig. 29, which shows a one-year-old stem in transverse section, we notice a relatively large pentagonal patch of tissue in the middle, this is the pith. Surrounding it the wood body appears as a conspicuous light coloured zone. On its outer limit the wood cambium appears as a pronounced dark coloured ring, outside of which a well-marked zone of small-celled tissue occurs, namely, the phloem or bast. Radiating from the pith through the wood-body and cambium are seen numerous dark lines—the medullary rays. Next to the phloem lies the cortex, which is surrounded by the epidermis. Certain raised or protruding portions of cortex and epidermis are seen. These are the scale-leaf cushions already referred to which cause the ridges and furrows on the young twig. In both wood and cortex resin canals are seen as round openings, whose structure has already been described in the case of the leaf. Fig. 30 illustrates tbe appearance of a three-year-old stem in cross section. Here we have three well-marked zones of xylem or year-rings. The outermost light coloured zone is the phloem which, like the wood-body, has also increased in breadth. This increase in thickness is due to the activity of the cambium which lays down secondary xylem on its inner side and secondary phloem on its outer side. The pressure caused by this internal increase in thickness has crushed the cortical cells together, hence the cortex appears thinner than in the one-year-old stem. The resin canals do not collapse owing to the resistance of their strong sclerenchyma sheath. In each year-ring of the wood we can distinguish two zones composed of spring wood and summer wood respectively. The cell-walls of the wood formed in spring are thin, and their interior cavities are large; whereas in the summer wood (the outer zone) the cell-walls are thick and their cavities small. We

will refer again to this point later. In the three year-old stem the medullary rays have become more numerous, but the newly formed ones do not run from pith to cortex. To make out the further structure of the wood-body we must next examine it in longitudinal section.

We may make two kinds of longitudinal sections, one, which is called the longitudinal radial section, lies in a median plane, that is, passes through the pith and divides the stem into two halves; while the longitudinal tangential section passes through the wood body at right angles to a diameter and divides the stem into two unequal parts. In the former section (Fig. 31) we see the medullary rays in surface view (the silver grain). At the right-hand side of the wood body in this photograph a portion of the pith is visible, and on the left is seen the cortex. This stem is also three years old. The first and second year-rings, however, being less pronounced in the photograph than the third or outermost one. It will be seen that the medullary rays do not extend from base to apex of the stem, but that they are plates of tissue only four or five cells deep. On the lower left-hand side of the photograph the broad, elongated, white streak is a cortical resin canal. The next photograph indicates the appearance of the stem in longitudinal tangential section. The broad oval patch seen to the left is the continuation into the wood of a bifoliar-spur-shoot, forming as it were a tiny "knot" in the wood. The cut ends of the medullary rays are seen as little spindle-shaped tiers of cells. Some of those medullary rays appear broader than others. The broad ones contain resin canals which, however, pass through the stem in a transverse direction and unite the longitudinal canals seen in Figs. 29 and 30. Fig. 33 shows the appearance of the longitudinal radial section under higher magnification. The left-hand side of the photograph is towards the pith, the right-hand side is towards the cortex. A portion of the two year-rings is shown. The outer limit of the year-ring to the left with the thick-walled, narrow cavited cells of its summer wood abutting on the thin walled, wide cavited cells of the spring wood on the inner limit of the next year-ring. (Compare Figs. 30 and 36). Running through both is seen a portion of a medullary ray. The superposed, white coloured patches on the side or radial walls of the spring wood are the so-called bordered pits, through which water

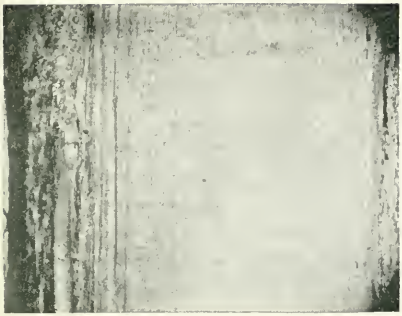


FIG. 31.

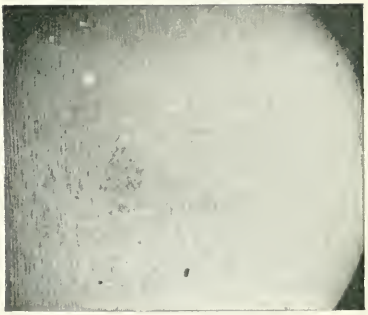


FIG. 32.

FIG. 33.

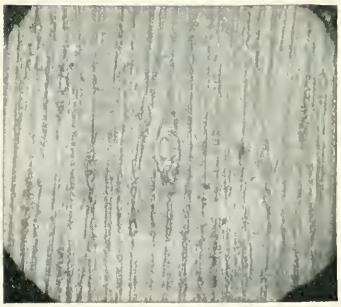


FIG. 35.

passes from one cell to another. The large oval patches of the medullary ray cells are also pits which communicate between the cells of the ray and those of the wood. The bordered pits are better shown in Fig. 34. Here the two characteristic concentric circles in each pit are seen. These pits are not open communication between the adjacent cells. They are rather thin spots in the cells, round which raised dome-like portions of the thickened cell-wall are formed. At the apex of these domes little orifices occur which we see as the inner circle on surface view. Those raised portions or bordered pits round the thin spots occur exactly opposite one another on each side of the cell-wall, the hollow cavities of which are only separated by the membrane of the pit. Fig. 35 is a magnified portion of stem in longitudinal tangential section. In the middle a medullary ray with a resin canal is shewn. On its left the pointed ends of two wood-cells (tracheids) are seen, and the bordered pits in their walls are cut in longitudinal section. The photograph (No. 36) shows a mature pine stem in transverse section. The pith appears in the centre as a mere point round which we see the concentrically arranged annual rings, each with its light coloured spring zone and dark coloured summer zone. The heart-wood (duramen) and the sap-wood (alburnum) can be made out by their difference in colour. Four "knots" occur in regular arrangement about the middle of the duramen. These are the bases of a ring of whorl branches. On the outside of the stem we notice the thick scaly bark.

The more suitable the soil and climate in which the pine is grown the greater becomes the proportion of heart-wood, which is of higher technical value than the sap-wood, since its cell-walls are dryer and impregnated with resin, tannins, etc., which give it greater strength and durability, and render the manufactured wood less liable to shrink and swell. Further, favourable soil and climate, together with skilful sylvicultural treatment, tend to increase the proportion of the red, thick-walled, denser summer wood in the year-ring, which enhances the technical value of the timber.

Fungus and Insect Enemies.

The Scots pine is subject to attack by fungi of various kind, some of which are very destructive, others less so, and the same

remarks apply to its insect enemies; hence we will only mention a few of the more destructive ones.

Fungi.

Agaricus melleus.—This is the honey agaric It attacks young as well as old stems. The yellow caps or sporophores are formed late in autumn, and appear protruding direct from the rind or the soil surrounding the root-collar. The tough, white mycelium and black root-like structures (the rhizomorphs) occur between the bark and wood on the roots and at the base of the stem. A copious out-flow of resin accompanies the attack. The exuded resin runs down and glues the soil to the roots in hard, encrusting masses. This is shown in Fig 37, while the rhizomorphs are seen in Fig. 38.

Trametes radiciperda.—Occurs on young and old plants. Abundant in pine woods during the pole stage on old agricultural land. The mycelium confines its attack to the stem-base and roots. The attacked wood shows white patches with black centres. Sporophores appear on underground roots or at the stem base. One side is snow-white, and bears numerous pores in which the spores are formed—the other side is of a brownish colour and does not bear pores. (See Figs. 39 and 40.) Early stages of attack may be recognised by the delicate white mycelium patches below the scales of the young bark. Here also there is a copious out-flow of resin from the diseased stem.

Peridermium pini.—Occurs on young stems, that is, of young plants, or the higher, therefore, younger parts of old stems. The mycelium lives in the cells of the cortex, phloem and wood. The cambium is killed and growth ceases at such places. There is an active secretion of resin at such parts, and the wood in consequence becomes very translucent. About June the fruit-bodies (æcidia) appear as yellow sacs. Young plants are soon killed, but older plants may carry on the struggle for many years. Fig. 41 shows a young diseased stem covered by the yellow pustular sporophores. In Fig. 42 we have an old stem, on three sides of which the cambium has been killed and year-ring formation has ceased, and the stem has assumed the characteristic irregular bulgy appearance so typical of this disease.

Fig. 39.

Fig. 41.

Fig. 47.

Fig. 48.

Insects.

Hylesinus piniperda.—This beetle bores into and tunnels out the pith near the apex of young pine shoots, with the result that they wither up and are broken off by the wind. See Fig. 43, where the insect, the hollowed-out twig and the larval tunnel beneath the bark are shown.

Hylobius abietis (Fig. 44).—Attacks young trees, destroying the bark and cortex of their bases, which they gnaw off in patches that become white with resin later. The larva with its characteristic bend and brown head is seen on the right of the figure, and a mature beetle is seen on the left. Another may be detected at work about the middle of the stem.

Pissodes notatus.—This beetle and its work is shown in Fig. 45.

Lophyrus pini (the pine saw-fly).—Its life history and work is illustrated by Fig. 46, at the top of which the male and female are seen. The caterpillar is shown to the left, and below it we have the cocoon with its tiny lid in which the period of pupation is passed. The needles of the central twig have been destroyed by the larvæ of this insect, which gnaw away the softer tissue around the hard central vascular bundles of the leaf. In bad attacks complete defoliation may occur.

Retinia buoliana.—This moth is called the pine-shoot twister. In Fig. 47 an adult specimen and a young attacked pine twig may be seen.

Retinia resinella.—This is another moth which attacks the pine, causing the large characteristic resin-galls inside which the larvæ occur.

Note.—Many of the figures alluded to in this essay have not been reproduced.

II.—THE SUITABILITY OF THE DIFFERENT VARIETIES OF THE DOUGLAS FIR FOR COMMERCIAL PURPOSES IN PURE OR MIXED WOODS, AND FOR CULTIVATION IN DIFFERENT SOILS AND LOCALITIES IN THE BRITISH ISLES.

By Mr. W. Forbes, York.

(*Awarded Gold Medal.*)

No exotic conifer—with the exception of the larch—is more generally appreciated throughout the British Isles than the Douglas fir. It was first introduced into this country in 1828 by David Douglas, under the name of *Abies Douglasii*; although it was discovered before that time by Archibald Menzies (who, like Douglas, was a native of Perthshire) on the shores of the Nootka Sound, during Vancouver's voyage round the world in 1792, and it was described in Lambert's "Genus Pinus," published in 1803 as *Pinus taxifolia*, and this is the oldest name it bears. Amongst other synonyms it has, are:—*Tsuga Douglasii*, given to it by the French botanist Carrière in his "Treatise on Conifers" (1855); then the same botanist, and half-a-dozen more, renamed it *Pseudotsuga Douglasii* (1867); Professor Sargent, in the "Silva of North America" (1898), called it *Pseudotsuga mucronata;* Link, in 1841, gave it the name of *Picea Douglasii;* Hooker and others, in 1837, agreed upon naming it *Pinus Douglasii*. In "Veitch's Manual of Coniferæ," 1900, Kent has named it *Abietia Douglasii*.

Commercially it is known in Britain as the Douglas fir, and may be found advertised under that name by several firms of timber merchants in the *Timber Trades Journal*, the first news-

TAYMOUNT DOUGLAS FIRS.

paper for the trade in England. In America it is known as the Douglas fir, Douglas pine, and Douglas spruce; yellow and red fir in several other States. It is the red fir and red pine of Canada, and the yellow pine of the Puget Sound. Evidently it is an introduction which has come to stay, and at any rate it is not likely to get lost for want of a name.*

There are a few other varieties, viz.:—*Abies Douglasii glauca*, synonym *A. Douglasii Coloradensis; A. Douglasii Standishii;* and *A. Douglasii taxifolia;* these are all more or less sports from the original Douglas fir.

In its native habitat on the Pacific coast the Douglas fir grows to a height of over 250 feet, having a stem diameter of from five to seven feet. There is a cross section in the South Kensington Natural History Museum, seven feet six inches in diameter; but trees of these great dimensions only grow upon the lower elevations, and their size decreases until at its highest vertical limit it is reduced to the size of a low bushy shrub. The bark of the adult tree is from three to five inches thick, of a reddish brown colour, and very deeply fissured; the inner cortex being of a brighter hue. Branches: slender, the higher more or less ascending. Branchlets: slender, distichous, mostly opposite, depressed or subpendent. Terminal buds: conic, acute, 0·25 to 0·5 inch long. Perulæ: oval-oblong, shining sienna-brown in colour, fringed with whitish hairs; very few buds are formed in the leaf axils, but a cluster of axillary buds occurs at the top of each branch capable of bearing long shoots. The leaves are persistent for six to seven years, pseudo-distichous in three to four ranks, narrowly linear, flat, and from 0·75 to 1·25 inch long, obtuse at the apex, curved upwards, bright lustrous green with an obscure median line above, paler, and with a glaucous stomatiferous band between the midrib and the thickened margins beneath. Staminate flowers on the lower side of the branchlets of the preceding year, axillary obtusely conic, about 0·75 inch long, surrounded at the base by broadly oval, obtuse involucral bracts in three to four series; anther connective spurred; pollen grains spherical. The cones are terminal on short lateral branchlets, pendant ovoid-conic, 2·5 to 4·0 inches long, and 1·0 to 1·25 inch in diameter, the scales are suborbicular with a short cernate claw and obscurely sinuate

* Editorial Note.—Chiefly imported under the name of "Oregon Pine."

margin; bracts longer than the scales, narrowly oblong at the base, with a prominent mid-rib; with two spreading lobes at the apex and the mid-rib prolonged into a rigid linear awn. Seeds are marked with an irregular white spot, and having a lenticular wing about one-sixth the size of the scale.

The grain of the wood is straight and smooth, and the pores well filled. One part of it is dull, and the other lustrous in alternate bands. When perfectly dry it weighs from 30½ to 38 lbs. per cubic foot, and for hardness it comes between the Scotch fir and the larch. The following gives the result of experiments made with different pine woods by Mr. Wilson Saunders, of Lloyds, by which the great superiority of the Douglas fir over the other pines subjected to the same test will be seen. They were all cut into lengths, and carefully squared to 1½ inch, and were then submitted to pressure of weights hanging from the centre, the lengths being supported upon standards exactly six feet apart. The weight at which each piece broke, and the amount of deflection from the horizontal line at the time of breaking, is given in the table following:—

Wood.	Lbs.	In.	Breakage.
Douglas fir	280	4·0	Fracture rough and long
Pitch pine	280	4·0	Fracture short and even
Canada spruce ...	196	4·7	Fracture short and rough
Red pine	168	6·0	Fracture rough
British larch	168	5·2	Fracture short and even
Deodar	154	3·8	Fracture short

The American lumbermen have two varieties of this fir, the red and the yellow; but the difference in the appearance is caused either by disparity in the age of the trees, or their disposal and locality. The red variety is coarser grained, and darker in colour than the yellow variety, and is not so valuable as timber. It is principally used for spars, flooring, and in general joinery; also for railway ties, piles, bridges, fencing and furniture. It is liable to the attacks of insects, particularly the teredo. It endures well when it is kept either always wet or always dry; but as a fence post it does not stand the alterations of weather so well as the

larch does; although it is more durable than Scotch fir, particularly in the younger stages of its growth.

The following was contributed by the officers of the Canadian Forestry Association to the *Canada Lumberman*, in October, 1902.

The Douglas Fir.

"What the white pine is to Eastern Canada the Douglas fir is to the Province of British Columbia, where magnificent forests of this tree will tower to majestic grandeur, reaching a height of 200, or even 300 feet. In such a forest, as in the shadow of the mountains, man begins to realize the great forces of nature which are working around him, and in his breast there rises that feeling of awe and reverence which must have influenced the worshippers of an earlier day, when they chose the forests as the temple of their gods. Look up, and still further up, and still the great tree towers till the eyes are strained in vain seeking to measure its height. Think of the power of unwearied effort by which little by little, from the diminutive seedling, such an immense column has been raised, and think of the pulsating life by force of which the water needful for its existence is carried through all that height of trunk and spread of branches; and man, be he christian, or pagan, or unbeliever, must recognise that he is here in the presence of one of the greatest manifestations of that mystery of power which he may designate life, but which he does not therefore any the more clearly understand.

"This tree is known most generally in Canada as the Douglas fir, though it is also designated as the red fir and the Oregon pine. The botanical name is *Pseudotsuga Douglasii*, or *Pseudotsuga taxifolia*, though the uncertainity about its classification before this name was settled upon may be seen from the other scientific names which have been applied to it, namely:—*Pinus taxifolia*, *P. Douglasii*, *Abies mucronata*, *A. Douglasii*. The generic name is derived from *pseudo*, false, and *tsuga*, hemlock; and the first specific name from that of the man who first described it and introduced it into Europe; while the second is from *taxus*, yew, and *folium*, a leaf. The flat leaves are scattered over the twigs, but they have this special character which distinguishes this tree, that they are set with the edges up and down instead of with the flat side uppermost as usual. It reaches its best development in

the coast district, though it is found all through the Southern part of British Columbia up to a height of 6,000 feet, where it appears in a stunted form. It passes over the Rockies as far east as the vicinity of Calgary. Its northern range is irregular, and still somewhat uncertain. The great size of the tree is shewn by the fact that as much as 500,000 feet have been cut from one acre,* while the average is from 30,000 feet to 50,000 feet, although only the trees between two and seven feet in diameter are usually cut. The bark is largely used for tanning, and the wood is suitable for a great variety of purposes, such as house building, ship building, bridges, wharves, piles, masts, furniture, fencing, etc. When excluded from the air it is very durable, and is therefore useful for piles, and the great length of the timbers which can be obtained makes it specially valuable for bridge building and similar purposes."

It is, on a suitable soil, and in a favourable situation, the fastest growing of any tree ever introduced into this country. We have heard of it containing an average of eight cubic feet per tree, at sixteen years of age: but as the writer of the article did not say where these specimens were to be seen, unauthenticated statements of this kind are not to be relied upon. Mr. A. C. Forbes, in his admirable book, "English Estate Forestry," says that at Longleat pure groups of Douglas fir, growing on the greensand, contain, calculated per acre, 2,500 cubic feet at 26 years of age; and most of these groups were planted 12 feet apart, and filled up with larch to four feet.

The oldest plantation of pure Douglas fir in Great Britain was planted by that veteran forester Mc.Corquodale, on one of the Earl of Mansfield's estates at Taymount, in 1860. These trees stand 12 feet apart, and were filled up with larch to six feet apart. Most of these larches were thinned out in the spring of 1873, which was the first thinning after they were planted, but none of the Douglas firs were touched. In 1897, Dr. Schlich estimated the contents at 3,700 cubic feet per acre. Since then the Earl of Mansfield had them actually measured and counted in 1899, and the result of this survey was:—

* In Canada the measurement of timber is estimated by board measure, and as there are nine superficial feet got from every cubic foot, this gives 55,555 cubic feet to one acre—the greatest volume of any timber.

1,535	Dominant Trees, average 25 feet ...	...	38,375 c. ft.
95	Dominated do. 4½ feet ..	...	427 „
	Total contents	...	38,802 c. ft.

This gives an average of over 124 cubic feet per annum, and the annual increment, Professor Fisher says, is now (writing in 1904) 163 cubic feet per annum. The same authority declares :— "This is the highest economic return ever produced by any tree in temperate regions." In 1899, the highest tree was 75 feet, and girthed seven feet, at five feet up ; in 1904, the average height was 82 feet, and the average circumference 50½ inches. The annual increment had increased 39 cubic feet per annum in five years. It is to be hoped that the Earl of Mansfield may continue these quinquennial surveys of this plantation, for the benefit of sylviculture in this country in particular. All calculations should be worked out by the quarter-girth system, as no other is recognised amongst foresters generally.

So far as rapidity of growth is concerned, nothing more could be desired ; but, unfortunately, as these trees stood so far apart, their side branches were retained too long, so pruning was resorted to, and the technical value of the timber is, in consequence, considerably reduced, a fact which Mr. Boppe predicted when he saw this plantation in 1884. But the Douglas firs in the Taymount plantation prove that this is the fastest growing timber tree ever introduced into this country. I may also mention that the trees composing this wood consist entirely of the "green" variety grown from Californian seed.

There is a glaucous variety of the Douglas fir which comes from Colorado, and was accidentally introduced by a firm of nurserymen through being supplied with the wrong kind of seed, and this variety was belauded by them as being more "frost-proof" than the green variety; but it is nothing of the kind, and this praise was only bestowed upon it for the purpose of clearing out their stock.

The Colorado variety, or glaucous Douglas fir, does not grow to half the size of the Californian species, and planters when ordering Douglas fir for planting should see that they obtain the Californian or "green" variety. It was the green variety which the Members of this Society saw so extensively planted on the

Durris Estate in August, 1904, and there were no indications of any of them, either young or old, having been in any way damaged by frost. The oldest trees of this species on the Durris Estate were planted about 65 years ago, and the highest measured 110 feet in height, while the greatest girth was 12 feet. These were specimen or ornamental trees and they were allowed to develop in every direction.

In the early excursions of the Arboricultural Societies, the beauty of a tree consisted, or was considered to consist, of an enormous spread of branches, and the spread of the branches of any large tree was always carefully noted. In furnishing dimensions of Douglas firs from different districts, in 1884, one forester writes :—"Growing close to the carriage drive are some unusually fine specimens of this tree, averaging from 70 to 80 feet in height, and girthing at three feet and five feet, respectively, 11½ feet and 9½ feet, with a diameter of spread of branches of over 50 feet." Another says :—"Of these Douglas firs the largest is 116 feet high, the trunk at three feet up is nine feet seven inches in girth, the lowermost branches lie flat on the turf, and measure 66 feet in diameter." I am inclined to think that this was the reason for so much early thinning amongst the plantations, until foresters saw for themselves the beneficial results obtained from keeping a close canopy.

As a shade-bearing tree the Douglas fir comes after the Norway spruce, and it can be grown as a pure crop, planted in quincunx order at four feet apart, or 3,144 trees to the acre. At Eberwalde, when experimenting with the Douglas fir for timber trees, they were grown pure, and stood about 3½ feet apart.

The Douglas fir is not fastidious as to soil, in fact, any kind of soil will suit it, provided it is devoid of lime; but it grows best in sheltered valleys in a deep soil and open subsoil. It grows well in any aspect, but a south or south-west aspect suits it best.

The Douglas fir is easily raised from seed sown in the open, and about two square inches should be allowed for every plant in the seed-bed, where they should remain for two years before being shifted into the nursery lines; when they are transplanted into them, there should be 15 inches between each row, and four inches between each plant. If the ground where they are to be finally planted is clean, and the trees are kept free from noxious

weeds overtopping them, they should be planted out as two years' seedlings, one year transplants; but if the ground is foul, allow them to remain another year in the nursery before putting out.

As the Douglas fir is by no means a "stormfast" tree, great care must be taken in planting them in the forest. They should always be pit planted, and their roots should be as naturally arranged as possible. If the soil adheres to the roots allow it to remain, for then the best possible results are sure to follow. It should always be planted out in spring, for choice, just after the equinoctial gales are over, as this gives it a chance to escape being "wind-rocked," and it becomes firmly established before the arrival of the autumn gales.

It may be planted as a pure wood wherever the conditions are favourable to its growth. But as Douglas firs for planting are still expensive to purchase, the expense of planting can be greatly reduced by using one-fourth Douglas fir plants and three-fourths spruce plants, the latter to be thinned out first. The spruce is the better shade-bearer, and will kill off the lower branches of the Douglas firs better than if the crop was one of pure Douglas fir, and for stakes, or pit props, the one is as valuable as the other. All weeds and undergrowth likely to over-top the young trees must be kept down, and if necessary this may require to have to be done more than once for the first two seasons after planting.

If weeds are permitted to over-top the Douglas firs, and to cover the shoots for a few weeks, they become very weak, and when they are relieved they are likely to produce "Lammas" shoots, which will not ripen sufficiently to withstand the frosts of the following winter; so it is imperative to keep the leading shoots clear of noxious growths until the trees are beyond their baneful influence. As the trees grow very rapidly, they generally require no clearing after they have stood two years in the wood. Artificial shelters of "storm-fast" trees can be made, but they must have been established many years before being of any service to the fast-growing Douglas fir.

The Douglas pine blight, *Sclerotinea douglasii* destroys seedlings and young trees; the conifer seedling disease, *Pestalozzia hartigii*, destroys the cortex above the ground and kills seedlings in large numbers; the white root-rot, *Rosellinia radiciperda*, injures the roots of the tree at a later stage of growth. So far as it has been

observed, the only insect to cause damage is the Cockchafer, *Melolanta vulgaris*. This insect will kill the roots of any species of tree it comes in touch with.

The time for thinning must be regulated by the rate of the growth of the trees, and as this will vary upon the different situations and soils, no hard and fast time limit can be stated. Even on the best soils thinnings should not commence until the trees are twenty years planted. If the plantation is healthy there will be no suppressed trees at that age, although there may be some dominated spruces; these should be removed, and a light thinning made, one-third of the spruces being taken out.

Assuming that the trees were planted four feet apart, there would be 786 Douglas firs and 2,358 spruces on an acre, deduct for deaths and useless trees 144, leaving 3,000 trees on every acre; and at the first thinning 750 spruces are taken out, these may be expected to yield on a low estimate :—

950 pieces pitwood, 15 feet by 2 ins. diameter, 11,250 lineal feet at 2/6 per 100 feet	£14	1	3
750 stakes, at 1½d. each	4	13	9
Total for first thinning	18	15	0
Cost of thinning 750 trees, at 1d. each	3	2	6
Nett amount	£15	12	6

If a selection of the best trees were made for light scaffold poles, more might be realized. Five years later another thinning would be taken, and the half of the spruce taken out, and the expected production would be :—

750 pieces pitwood, 20 feet by 2 ins. diameter, 15,000 lineal feet, at 2/6 per 100 feet	£18	15	0
750 stakes, at 1½d. each	4	13	9
Total for second thinning	23	8	9
Cost of thinning 750 trees, at 1d. each	3	2	6
Nett amount	£20	6	3

The remainder of the spruce would be thinned out at the thirtieth year, and it ought to yield :—

750 pieces pitwood, 20 feet by 3 ins. diameter, 15,000 lineal feet, at 3/6 per 100 feet	£26	5	0
1,500 stakes, at 1½d. each	9	7	6
Total for third thinning	35	12	6
Cost of thinning 750 trees, at 1½d. each	4	13	9
Nett amount	£30	18	9

This will leave 750 Douglas firs standing on an acre, at thirty years after planting, and these trees should average five cubic feet, or a growing stock of 3,750 cubic feet per acre. At forty years of age another thinning would be required, and one-fourth (188 trees) of the Douglas firs would be cut out, and if these trees averaged only one-half the volume of timber of those at Taymount plantation, or say 12 cubic feet each, this would yield 2,256 cubic feet of timber ; and at sixpence per foot this gives :—

2,256 cubic feet, at 6d. per foot	£56	8	0
57 loads cutting, at 2/- per load	5	14	0
Nett amount	£50	14	0

Ten years later a second thinning of the Douglas firs would take place, and another 188 trees would be thinned out, and these would average 20 feet each at that age, so :—

3,760 cubic feet, at 6d. per foot	£94	0	0
94 loads cutting, at 2/- per load	9	8	0
Nett amount	£84	12	0

The next cutting would take place sixty years after the trees were planted, and 187 trees, averaging 30 cubic feet would not be too much to expect yielding :—

5,610 cubic feet, at 6d. per foot	£140	5	0
140¼ loads cutting at 2/- per load	14	0	6
Nett amount	£126	4	6

There would be 187 trees of the same value left on the ground at sixty years of age, counting from the time of planting, so the total sum realized is :—

First thinning...	£15	12	6
Second „	20	6	3
Third „	30	18	9
Fourth „	50	14	0
Fifth „	126	4	6
Value of standing timber	140	5	0
	£384	1	0

From the above amount the cost of planting, rent, rates and fencing must be deducted, and these will be taken in their order, commencing with the

PLANTING.

786 Douglas firs, 2 year, 1 year, at 20/- per 100 ...	£7	17	3
Pit-planting at 3/4 per 100	1	6	2
2,358 Spruces at 25/- per 1000	2	19	0
Notch planting at 6/8 per 1000	0	15	9
Total cost of planting	£12	18	2

RENT.

60 years at 10/- per acre	30	0	0

RATES.

60 years at 4d. per annum	1	0	0

FENCING.

60 years at 1/- per annum	3	0	0
	£46	18	2
This gives an annual revenue of £5 12s. $4\frac{1}{50}$d. × 60	337	2	10
	£384	1	0

I have not calculated the cost of planting and then added so much per cent. per annum to it for sixty years, but have reckoned it as a going concern. When a farmer lays a field down to grass with his landlord's consent, he only gets paid for the cost of the seeds, and even if he remained fifty years upon the place after seeding the field, he would not get interest and compound interest for the money he laid out upon these seeds; so I contend the cost of planting ought to be computed in the same manner. There might have been a crop of timber sold off the same ground amounting to ten times the cost of plants and planting, therefore the price paid for replanting should be deducted from it.

No. of trees per acre.	Age of trees.	Average contents.	Total.	Thinned out cubic feet.	Stock left.	Age of stock.	Total increase per acre.	Annual increase per acre.	Annual increase per unit.	Remarks.
750	30	5	3750	nil.	3750	30	3750	225·0	2 c. ins.	As the trees get thinner on the ground the annual increment is greater.
750	40	12	9000	2256	6744	40	5250	525·0	8·4 c. ins.	
562	50	20	11,240	3760	7480	50	4496	449·6	9.56 c. ins.	
374	60	30	11,220	5610	5610	60	3740	374·0	1 c. foot	
187	60	30			5610					

At sixty years of age the total volume amounts to 17,236 cubic feet, and if the timber is allowed to stand until it is eighty years of age it will easily average 60 cubic feet per tree, so that if felled off at that age the final fall will yield 11,220 cubic feet, bringing the total volume up to 22,846 cubic feet.

The foregoing figures are all approximate, and I am inclined to think they are within the possibilities of the Douglas fir planted on a suitable soil and situation. This tree may be seen growing well—not merely existing—from Cornwall in the south to Sutherlandshire in the north: and splendid specimens are to be seen all over Wales, in Ireland, and the Isle of Man. These in most cases are planted as specimen trees, still, they serve to shew that they can be grown, and grown successfully, in certain localities in every part of the British Isles.

For the accompanying photograph of the Taymount Douglas firs, I am indebted to Mr. Pitcaithley, forester to the Earl of Mansfield, who died after this paper was written.

III.—CASTLE HILL ESTATE, NORTH DEVON.

One of the Estates Reported on for Earl Fortescue.

By W. R. Fisher.

Working-Plan, 1905-1919.

Part I.—General Character of the Locality.

The Castle Hill Estate, the property of the Right Honourable Earl Fortescue, is situated on a series of plateaux more or less undulating and intersected by combes, most of which drain into the river Bray, that joins the river Taw at South Molton Road. Bushton water is another small tributary of the river Taw, near the western boundary of the estate, and joins that river at Bishops Tawton, after passing through Swimbridge.

A range of low hills to the north of the mansion runs across the general drainage of the country from east to west, forming an apparent valley traversed by the Great Western Railway towards Barnstaple, which is nine miles from Filleigh, the nearest railway station, the latter being about a mile from the mansion and in the centre of the estate. The London and South Western Railway, with a station at South Molton Road about nine miles south of the mansion, follows the valley of the river Taw to Barnstaple, and is not far from the southern boundary of Castle Hill. The estate is therefore admirably situated for the sale and disposal of timber, and is well intersected by good metalled roads.

The altitude above sea-level is highest (879 feet) near Mockham Down Gate, to the north of the estate, and lowest (224 feet) at Bray Bridge in its extreme south, the mean altitude being about 450 feet above sea-level.

The subjacent rock is chiefly Devonian shale, locally termed shillet, with some limestone in the low hills, especially Whitehills; here, there is a line of old quarries, now worked out, where lime was formerly burned. South of the Great Western Railway is a bed of stiff blue clay, which is very retentive of moisture.

The shillet gives rise to well-drained loam of varying consistency forming an admirable soil for forest trees, but on the clay, as a rule, only oak, ash and alder, and perhaps spruce, can be grown with advantage.

There is a meteorological station at the Castle Hill Technical School, at 363 feet above sea-level. Here, the annual rainfall between 1890 and 1903 has varied from 27·23 inches in 1891, to 53·45 in 1903, the average rainfall being 41·79 inches. It is well distributed throughout the year. The mean temperature during the same 14 years was 48·37° F. The highest and lowest temperature observed were 87·3° F. in 1893, 87° F. in 1901, and 8·9° F. in 1895, and 9·5° in 1891.

The fall of snow in winter is very light, and does not remain long on the ground. Wintry weather does not set in generally till January, and of late years the winters have been mild. The springs are cold, owing to the prevalence of the north-west wind, which sometimes blows with great force and damages the woods. This wind also brings from the sea saline spray that is injurious to trees. Fog is prevalent, and the humidity of the air generally ranges between 80 and 90 per cent. Owing to the cold springs, the hawthorn rarely blossoms till June is well advanced.

Rabbits are well kept down on this estate, and this must always be done, as without rabbits wire-netting can be dispensed with and much expense saved. Good fences to the woods are everywhere necessary to keep out sheep and cattle.

All the woodland compartments with their numbers are shewn on the six-inch Ordnance Map that accompanies this report, and some of them in larger detail on tracings.

Part II.—Nature of Woodland.

The woods are usually in the combes, where they are sheltered against the wind. There are, however, some woods on the comparatively flat clay lands south of the railway, the soil there being often unsuitable for agriculture. There is scarcely any oak

coppice, although this is a prevalent form of woodland in Devonshire, and points to the former existence of extensive oak forests as the natural woodland of the country before it was cleared for agriculture. Nearly all the woods on the estate result from plantations made at different periods. The high banks round the fields in Devonshire are usually topped by stiff hedges of beech, oak, hazel and other species, and these are cut periodically, and partially supply the farmers with fuel and stakes.

The chief species planted in the Castle Hill Estate are larch, oak, ash, also spruce and Scotch pine. Hazel and alder are common in the underwood. Glaucous Douglas fir, a variety of *Pseudotsuga mucronata*, *Sudw.*, has been planted since 1860, but only as isolated trees in the mixed woods. It thrives well in localities fairly sheltered from the strong winds, and has attained nearly eight feet in girth and 90 feet in height in 40 years. Experience in Britain has hitherto been, that although Colorado Douglas fir is hardier against autumnal frost than the green or Pacific Douglas fir, both being varieties of *P. mucronata*, it is of slower growth than the latter; this is most marked in forest nurseries where the green variety attains a height of 1½ feet in two years, which the Colorado Douglas fir attains only in four years. The rapid growth of the green variety is chiefly due to its stronger leaders, and because in its youth it makes two shoots a year. It is this peculiarity that renders it susceptible to early frost, as it withstands winter well. The Colorado Douglas fir shoots early in the spring, and suffers from late frosts, which often deprive the plants of their leading shoots. These, however, they replace without difficulty. At Castle Hill, glaucous Douglas fir completely outstrips larch in height and diameter-growth. This variety has not, however, as yet been grown in Britain in dense woods, and as it is certainly not Colorado Douglas fir, it will be better to plant Pacific Douglas fir in future. In British Columbia, the Pacific Douglas fir attains large dimensions, and forms a splendid timber, which was selected by Nansen in building the *Fram* for its strength; there is no reason why, if it be grown sufficiently dense, timber of excellent quality should not be produced by Douglas fir in Britain. It is extensively cultivated by the Duke of Bedford near Tavistock, and it would be well to send the Castle Hill woodman there next summer to study the methods employed.

Larch, though occasionally suffering from canker (*Dasyscypha calycina*), is generally able to resist this disease at Castle Hill, especially where grown above the shillet on the slopes of the combes. It is not wise to attempt to grow larch on the wet clay soil except in isolated groups on drier patches of ground. Its growth is stimulated by a mixture of beech, as this tree forms an excellent humus on which the roots of the larch feed, and the shadebearing beech clears the boles of the larch and promotes its upward growth. Where larch succeeds broadleaved trees this mixture may not be necessary; pure larch crops afford small wood from thinnings for estate purposes, and are probably cheaper to plant than the mixture. I am, however, strongly of opinion that the growth of pure larch is not so good as when it is mixed with beech, and that such woods are more liable to disease than the mixed woods of the two species.

The following larch trees have been measured recently by the forester :—

No. of Tree.	Name of Wood.	Age.	Girth at Chest-Height.	Height.	Remarks.
1.	Bray	16	2 ft. 0 ins.	33½ ft.	Deep hollow
2.	Higher Beer ...	36	3 ft. 2 ins.	72 ft.	Valley
3.	Lower Beer Pln....	36	3 ft. 2 ins.	55 ft.	Level ground
4.	Lower Beer ...	22	2 ft. 8 ins.	54 ft.	Level ground better sheltered than No. 3
5.	Long Walk ...	40	3 ft. 10 ins.	57 ft.	Do.
6.	Knap Quarry, Tilery covert	56	5 ft. 0 ins.	70 ft.	Exposed to wind

I had not time during my visit to Castle Hill to make sufficient measurements of larch to ascertain accurately its rate of growth at different ages, and it is advisable that such data should gradually be collected whenever any larch woods are felled, or thinnings made, and the results recorded.

New larch plantations, whether with or without beech, should be made four feet by four feet, and be left unthinned for 15 years. The first thinnings should then be made, and will yield poles either saleable at about 2s. 6d. per dozen, or utilizable for estate

purposes. The second thinning should be made at the age of 25 years, and will yield poles worth about 5s. per dozen, and subsequent thinnings made every 10 years until the trees are 45 years old, when they should be allowed to mature for the final crop, worth 1s. per cubic foot at 55 or 60 years. I have not sufficient data to fix the final age at which the felling of the old crop will be most profitable. Meanwhile, the beech should be allowed to grow up in the larch woods, provided it is considered as a nurse to help the larch to grow well and not for its own value, and should be lopped or removed whenever it interferes with the more valuable tree.

Some Japanese larch are now being experimentally planted in one of the compartments. This species grows rapidly in its youth. It is not yet sufficiently known in England for any certainty to be felt as to its future value. In fact, the Tyrolese larch grows so well at Castle Hill that there is no necessity for replacing it by the other species. At the same time, by planting a certain area with Japanese larch and an adjoining area on similar soil, and with the same aspect, with Tyrolese larch, important information as to their comparative rate of growth and yield in quantity and quality may be secured.

Both the Sessile and Pedunculate oaks grow well at Castle Hill. The former is commoner and of finer and healthier appearance on the higher land, but the Sessile oak does not occur on the wet clay, which is more suitable for Pedunculate oak. The Sessile oak is probably indigenous, and is a handsomer tree and suffers less from insect galls and from saline spray than the Pedunculate oak. Care should be taken to collect the acorns of the Sessile oak, and to plant it on the drier land in the ornamental woods.

Only one oak has been measured by the forester, and its species is not mentioned. It was planted in 1820, in Shippen Close, and is consequently 84 years old, without allowing for its age when planted. It is four feet six inches in girth at chest-height, and fifty feet high. It is not likely that oaks will grow tall under the system of coppice-with-standards, but if careful measurements of any oaks that are felled are made and recorded, it will, I believe, be found that greater girth than four feet six inches will be attained at Castle Hill in 84 years.

There are few large ash trees on the estate, but this species

reproduces itself readily from seed, and if carefully cultivated on suitable soil will probably give satisfactory results. Its rate of growth should be carefully measured and recorded whenever opportunity arises. It is proposed to grow both oak and ash as standards over underwood, and ash also as underwood. Oak and ash trees of a fair size sell at 14d. per cubic foot. About 10 per cent. of larch may also be grown as standards over underwood wherever the soil is not too wet, they will give an earlier return than the broadleaved saplings.

Alder also should be grown as underwood, as alder poles of suitable size are saleable at Barnstaple for making toys and broom-heads, at 16s. per ton, while it costs 6s. a ton to deliver them there. In Sussex, alder is also saleable at 8d. per cubic foot for clogs, and in lengths of three feet, and not more than four inches in diameter, at 25s. per ton for gunpowder making. It would be useful to plant some white alder (*Alnus incana*) as well as black alder, the former species is more adapted to drier soils than the black alder, and its wood is of somewhat better quality. This, however, should be done only experimentally until the value of the species has been tested for Castle Hill.

Hazel is largely represented in the underwood, and is useful for spar stakes and for hoops for barrels. In future, however, all planting of gaps in the underwood and all other new plantings of underwood should consist of mixed alder and ash, planted five feet by five feet, as these species are more valuable than hazel and serve better to clean the boles of the standards. All the above species may be planted whenever the ground is free from frosts between November and March.

In spite of the supply of wood fuel from the farmers' hedgerows, there is a ready sale of firewood faggots from the woodlands at 8s. per 100, one acre of good underwood being said to yield about 800 faggots, and being consequently worth £3 4s. 0d.

There are a few spruce, Scots pine and silver-fir on the estate, but as they are inferior in value to larch, grow more slowly, and yield worse timber than that of Douglas fir, it is not proposed to plant them in future, at Castle Hill. Some silver-fir may, however, be

occasionally used, as well as Douglas fir, for filling gaps in some of the younger larch woods, as their shade-bearing qualities render them suitable for such a purpose. The silver-fir should be used where the gaps are small, and the Douglas fir where the gaps are large and caused by the removal of branchy beech trees, etc., and where its rapid growth will enable it to catch up the older larch trees in the compartment.

Corsican pine grows well here, and its great power of resisting gales renders it advisable to plant it in belts in exposed places. It is best to plant it in the spring, just before the shoots appear.

The Agent, Mr. Smyth-Richards, informs me that Castle Hill has never been troubled with pine-weevils, and that there is no necessity for delaying the replanting of conifers on land that has already been cleared of coniferous trees. This is usually necessary, as if planting is undertaken before the old stumps have rotted, pine-weevils breed in these and proceed to eat the new plants. The presence of noxious insects and of destructive fungi must be carefully observed and due precautions taken to prevent their spread.

A detailed account of each woodland compartment is given at the end of this report.

The total area of woodland at Castle Hill is as follows:—

Broadleaved Woods	463½ acres
Coniferous Woods	568¾ acres
Total Economic Woods	1032¼ acres

The ornamental woods (136½ acres) are not included in this working-plan, and they will be managed by the woodman in accordance with the wishes of the owner; the expenses of maintaining them should be kept separate from those of the economic woods. There will be some returns from the ornamental woods that will partly repay these expenses.

Mr. Smyth-Richards states that the woodman and his fifteen labourers will be required to assist in hay-cutting and in general work on the estate for two months in the summer, but during the

rest of the year their services will be exclusively used in the woods, including those of the Exmoor and Challacombe properties, regarding the woodlands in which a separate report will be submitted by the present writer.

Part III.—Proposals for Future Management.

Hitherto the woodlands have been managed without any well-considered system, so that the underwood in most of the broad-leaved woods has not been cut for years. Many large branchy standards are mixed with coniferous trees, and in some cases broadleaved trees are grown where conifers would thrive, and *vicê versa*. The present woodman has begun putting the woods in order, but he requires clear instructions for systematic working, and these can be conveyed only in a carefully considered working-plan. It is only by following out through a long term of years a suitable scheme, approved by the owner of the property, that satisfactory results in forestry can be attained. I have spent only $4\frac{1}{2}$ days at Castle Hill, but have seen all the woods, and have had long consultations with Mr. Smyth-Richards and with the woodman, and I have to thank them for the ample information given me on every point on which I wished to be enlightened. The Hon. John Fortescue has also helped me in many ways.

Broadly speaking, the shillet soil is everywhere suitable for conifers, and the clay soil is unsuitable for them, but will grow broadleaved species. I have also been informed that the underwood is always saleable, provided too much is not thrown on the market in any particular year. Few private proprietors in England will wait for the long rotations necessary to produce good broad-leaved wood in high forest. It is therefore a fortunate circumstance at Castle Hill that oak and ash can be grown as standards over coppice, and that the underwood can be disposed of. Were the brickworks on the estate arranged for burning wood instead of coal this would be a great help in disposing of much of the underwood. I propose to manage the broadleaved woods as coppice-with-standards.

The following statement gives the dates when woods were underdrafted :—

No.	Wood	About years ago.
1.	Lower Beer Wood ...	22
2.	Do. Plantation	17
3.	Tilery Wood	26
8.	Pugsleys Hill ...	28
11.	Gowlersmoor	26
13.	Brandis Close ...	30
31.	Tadipot Wood ...	5
44.	Boundys Wood ...	9
51.	Bremridge N. ...	20
54.	Do. S. (10 a.) ...	21
57.	Do. S. ...	17
58.	Whitehills	30
59.	Do.	30
60.	Whitehills	25
62.	Do.	25
65.	Do.	25
67.	Woodhouse Brake...	30
68.	Highbray Plantation	24
69.	Highbray Wood ...	24
72.	Shippen Close ...	27
76.	Cawseys Barton ...	23
78.	Spa Wood	26
79.	Heddon Bottom ...	28
82.	Crossbury Wood ...	10
83.	Proutworthy Brakes	20

It is therefore evident that the work of cutting the underwood must now be undertaken for nearly all the broadleaved compartments. As I do not wish to flood the market with unsaleable material, I propose to distribute the coppice fellings over 15 years, in accordance with a statement of annual fellings at the end of this part of the working-plan. At the end of this period of 15 years, in 1919, a new working-plan should be prepared, and the age at which the underwood should then be cut finally settled—probably 25 years will be best. Meanwhile, I propose to work the woods as follows :—

Broadleaved Woods.

The broadleaved woods include two blank areas, Nos. 61 and 66 (Part of Whitehills), of 32½ acres, which will be planted in 1906-7, and this brings up the total area of these woods to 463½ acres.

The 32½ acres of blanks will be planted up with oak, ash and alder, 5 feet by 5 feet, and four years after planting, the ash and alder plants, except such ash saplings as are intended to form standards, should be cut back level with the ground to form underwood stools, leaving a sufficient number of oak and ash standards ; 10 per cent. of larch may also be planted for standards wherever the soil is suitable. These will then be allowed to grow up till 1919, when they will be put into their proper place in the sequence of felling areas, and a suitable rotation fixed for the

underwood. I have been informed that it is proposed to plant some other areas on the clay land with broadleaved species, and such areas will also be included in the new working-plan to be made in 1919. They should be planted in the same way as 61 and 66, and should be similarly cut back four years after planting. It is also proposed in 1904 to plant four acres in No. 51 (Bremridge) and four acres in No. 83 (Proutworthy Brakes) with oak, ash and alder.

The 431 acres now to be worked will be cut over at the average rate of 28 or 29 acres per annum, in accordance with the statement of fellings at the end of this chapter. All branchy and unpromising standards should be felled, and also such conifers as are noted for felling in the Description of Compartments. Good standards should be carefully pruned. All blanks should be filled up in the same manner as that proposed for 61 and 66. The object in view is to form woods with standards of all ages, from mere saplings to mature trees. The following proportion of such standards is advisable per acre :—

	No. of trees.
Standards of Four Rotations	3
Do. Three do.	3
Do. Two do.	12
Tellers of One Rotation of underwood	20
Saplings planted after last felling	50
Total, per acre,	88

This should give about 1000 cubic feet of standards, quarter-girth measure, per acre, when the woods are properly constituted. Each sapling and standard should have its crown free, and should depend on the pressure of the underwood for clearing its bole. Eventually about 500 cubic feet of standards may be cut annually over an acre of mature underwood.

Seven years after the underwood has been cut, in any compartment, the woodman should go over the area carefully and set free each sapling standard from invasive coppice shoots of the underwood, and prune off double leaders and lower branches, but the latter should be sparingly done. The years in which this should be done are noted in the statement of fellings.

Coniferous Woods.

I have included some compartments, which are at present under broadleaved trees, to be cleared and planted with conifers, as it is advisable to increase the area of the latter. Such are Nos. 13 (Brandis Close), 13 acres of No. 14 (Riverton), 16 (Late Swimbridge Glebe), 20 (Ashen Copse), 22 (Indicombe), 33 (South Stoodley), 38 (Tossell Barton), and part of 80 (Higher Beer). Leaving out 80, where I am ignorant of the area of the oaks to be cleared, the broadleaved area that should be cleared and planted with conifers is 48 acres. Besides this area, I propose to clear and re-plant 113½ acres of coniferous woods, which are either mature or in bad condition; this area includes the oaks to be felled in 80. All this work is to be effected in the 15 years between 1905 and 1919, including the following work, which is to be done this autumn, but will not be finished before 1905:—

No.		Acres.		
15.	Collythorne ...	13¼	To be planted with	larch.
22.	Indicombe Barton	10	do.	larch and beech
36.	Clockhay Wood	4¾	do.	do.
50.	Embercombe	2½	do.	Japanese larch
80.	Oaks in Higher Beer Wood		do.	larch
75.	Cawseys Barton	3	do.	larch and beech
18.	Birchin Copse	21¼	Replant plants damaged by rabbits.	

Total cleared and planted in 1904, 33½ acres; also 21¼ acres to be filled up.

The dates of clearing and planting the 190½ acres are given in the statement of annual fellings, together with the areas to be dealt with each year from 1905 to 1919, averaging 12⅔ acres per annum. The clearings are to be planted with larch and beech, pure larch, or Douglas fir, with some belts of Corsican pine, in accordance with the directions given in the description of coniferous woods. Planting here should be four feet by four feet, and beech and larch will be equally distributed when this form of planting is to be adopted, alternate plants of each species being planted in lines.

Each plantation should be carefully gone over by the woodman in the two years succeeding the planting, and the plants set free from invasive coppice-shoots, etc., while failures which it is not

advisable to fill in with larch, should be re-planted with strong beech or Douglas fir plants.

The first thinnings in these new woods, except those planted in 1904, will not be begun before 1920, when the woods will be 15 years old.

The remaining area of growing coniferous woods, 380¼ acres, will be thinned in accordance with the scheme of thinnings laid down in the statement of fellings and thinnings. This will be completed in 10 years, at the average rate of 38 acres per annum. In 1915, these thinnings will be recommenced over the same area as before. Of the new area to be planted in 1904, all but 23¼ acres consists only of blanks in existing woods; thinnings in these will be carried out in accordance with the tabular statement, which also prescribes the thinning of the then planted 23¼ acres, in 1919, and the thinning between 1905-1909, of 64¾ acres of the older woods, which will be cleared before 1920.

In all these thinnings care should be taken to give the larch sufficient room to develop good crowns and roots, so that it may grow vigorously. The Douglas fir plantations should be kept dense enough to force on height growth and maintain the growing trees free from lower branches. Sufficient experience as regards the Douglas fir wood is not, however, yet acquired, and these woods must be carefully watched and the thinnings conducted in accordance with general principles to be gathered from a good treatise on Sylviculture, until a definite knowledge of their application to this species has been obtained.

The shelter belts of Corsican pine must be managed differently, the outer row of trees should be allowed to branch down to the ground, and this should be secured by gradually removing all close growth of the pines in these belts.

I have not prescribed any fixed rotation for the coniferous woods, nor is it at present necessary to do so. By 1919, sufficient knowledge of the growth of conifers at Castle Hill should be secured to enable the person employed to draw up the new working-plan to fix the rotation in accordance with the market value of timber at that period. The statement of annual fellings and thinnings, which now follows, gives the dates of all fellings and thinnings prescribed till 1919.

Statement of Annual Fellings and Thinnings, 1905-1919.

Year.	Broadleaved Woods.				Coniferous Woods.					
	Fellings.		Thinnings.		Fellings		Thinning Young Woods		Thinning Old Woods.	
	Compartment No.	Acres	Compartment No.	Acres	Compartment No.	Acres	Compartment No.	Acres	Compt No.	Acres
1905	1, 2, 8	26¾			6, 13	11	17, 75, 50	42¾	77	4½
1906	58, 59	30½		8	Pt. 14	13	Pt. 14, 25, 27, 29	30¾	45	4¼
1907	Half 3	25			7	14	41, 42	36	55, 56	21
1908	32, 60, 62	28½	Cut back 51, 83		16, 19	9	Pt. 49, 46, 47, 9	40¼	80	24½
1909	Half 3	25		12½	20	12	70	32	81	10¼
1910	11	29½			26, 28, 33	11¼	21, 24, 30, 63	35		
1911	64, 65	34	Cut back 61	20	34, 35	15½	18, 36, 37, 53	38¼		
1912	51, 54	32	Thin 1, 2, 8	26¾	38, 39	14	52	44		
1913	67, 68	33	58, 59 Cut back 66	30½	Pt. 40	11	5, 10, 12, 48, 4	31¾		
1914	72, 79	27	61. Half 3	37½	Pt. 40, 45	14½	Pt. 49, 43, 74	28¾	359½	Acres
1915	73	26	32, 60, 62	28½	55, 56 Pt.	13	As in 1905	42¾		
1916	76, 78	34	Half 3. 66	45	Pt. 56, 77	12½	,, 1906	80¾		
1917	83	30	11	29¼	Pt. 80	12½	,, 1907	36		
1918	57	27	64, 65	34	Pt. 80	12	,, 1908	30¼		
1919	44, 69, 82, 31	22¾	51, 54	32	81	10½	70, 15, 22	55¾		
	Total cut	431	Acres		Cut	185½	Acres			
	Planted 1907, 61	12½	,,		Planted 1904, 15	13¾	,,			
	,, 1909, 66	20	,,		,, ,, 22	10	,,			
					Young woods thinned	359½	,,			
	Total Broadleaved	462½	Acres		Coniferous	568¾	Acres	Grand Total—1032¼ Acres		

Part IV.—Management of Nursery.

There is a well-situated Nursery at Castle Hill. Its area is 4½ acres, and it is well adapted for growing larch, Douglas fir, ash, oak, alder and Corsican pine, which are all that we are now concerned with.

The number of plants required annually during the next 15 years will depend on the areas to be planted each year in the felling areas and to fill up blanks in the areas thinned. It is impossible to say what will be required for the coppice-with-standards, as these woods are at present so variably stocked with standards and underwood.

Assuming that 28 acres are cut annually in these woods, about 250 oaks, ash and alder plants per acre should be required annually, or, say, 7500 plants: also 25 larch plants per acre wherever this species will grow.

The oaks, ash and larch should be strong transplants about four or six years old (the latter for oak), and the alder two or three years old. Arrangements should at once be made to sow acorns, and to purchase yearling ash and alder plants to line out in the nursery so as to ensure this supply. Until the seedling oaks have grown up it will be necessary to purchase plants of sufficient size for the woods, and great care should be taken that only well-rooted, vigorous plants are used. The broadleaved plants lined out should be at distances of 1 foot by 9 inches, and should be kept close for four or five years in the nursery lines, so that they may be straight and free from branches.

Besides the 7500 plants referred to, as required annually, plants should also be purchased or raised in the nursery for the 32½ acres to be planted in 1907-1909, and for any other areas that it may be wished to plant on the clay soil. These plantations will require 1750 plants per acre, or allowing for failures, 2000 plants per acre, 65,000 plants in all.

As regards the coniferous plantations, the 12⅔ acres to be planted annually will require 3000 plants per acre, allowing for failures, being 38,000 plants in all. These plants will be in the

ratio of ten Douglas fir to fifteen larch and five beech, but reference should be made each year to the directions in the Description of Compartments, and the woodman should submit annually a list of the necessary plants that will be required two years later, so that the requisite number of seedling plants may be lined out in the nursery two years before they will be wanted for the woods. It is best to line out larch and Pacific Douglas fir as yearlings, and two-year-old beech.

If sowings are made in the nursery, it may be considered that one lb. of seed will produce 10,000 seedlings of larch and Douglas fir. Sufficient beech seeds should be sown this year when mast is plentiful, as beech seed-years are rare. The few Corsican pines, that are required, can easily be raised from seed and lined out as two-year-old plants.

There will be no coniferous plantations, except those included in the 190½ acres, as it has been arranged that Nos. 15 and 22 are to be planted in 1904.

Arrangements must be made to keep the nursery fertile by manuring the areas from which the four-year-old plants have been removed. I have found basic slag in the autumn as a top dressing and nitrate of soda in the spring, excellent manure for conifers. For the broadleaved plants ordinary old farmyard manure is sufficient, and a crop of potatoes may be grown before re-stocking the area over which the plants have been taken. This will keep the ground free from weeds.

Part V.—Financial Returns.

Owing to the irregularity of the woods in their present condition, it is impossible for me with my present knowledge of Castle Hill to give anything but a rough estimate of their probable yield. As soon, however, as the broadleaved woods have been put into order with a good distribution of standards, they should yield at least 25s. per acre annually, while the coniferous woods will produce £2 10s. 0d. per acre, giving altogether an income of £2000 per annum. The sporting value of the woodlands and their utility to the farms should also be taken into consideration.

The expenses in rearing and purchasing plants, as soon as the new areas have been stocked, will be the cost of 46,000 plants per annum at about 30s. per mille, or £69 per annum. The cost of planting, felling and thinning, will be the wages of the woodman and 15 labourers for 10 months in the year, after deducting the cost of their work in the other woodlands at Challacombe, Exmoor, etc. I must ask Mr. Smyth-Richards kindly to add this figure to the total cost and draw the balance.

Careful records should be kept of the cost of the nursery, and of the receipts and expenditure in each of the compartments in Castle Hill. I append a statement of the receipts and expenditure on the woods during the last ten years, but this also includes the Challacombe woods. The net profit has been £762 per annum.

Approximate financial statement follows as to Earl Fortescue's woods at and around Castle Hill, including Challacombe, but not Chulmleigh, Wear Gifford and Morthoe, for 10 years ending 31st March, 1904.

For year ending	Receipts.	Payments.	Profit.
31st March, 1895	£1055 11 2	£634 10 7	£421 0 7
Do. 1896	1135 0 5	610 5 4	524 15 1
Do. 1897	1768 12 1	790 17 10	977 14 3
Do. 1898	1273 6 4	768 11 11	504 14 5
Do. 1899	1211 10 2	626 18 6	584 11 8
Do. 1900	1648 9 4	763 3 9	885 5 7
Do. 1901	1324 13 11	653 19 11	670 14 0
Do. 1902	2277 0 7	592 3 1	1684 17 6
Do. 1903	1623 10 5	975 16 4	647 14 1
Do. 1904	1767 19 7	1044 13 8	723 5 11
	£15,085 14 0	£7461 0 11	£7624 13 1

Then follows an appendix giving a description of each of the 81 compartments of the Castle Hill woods, of which the following is a specimen :—

Name of Compartment.	No.	Acres.	Situation and Soil.	Age of underwood.	Description of Crop.	Proposed Treatment.
Lower Beer Wood	1	12	Above fishpond N. of Oxford Down Clay soil.	32	Dense crop of ash and oak standards with a few Douglas firs over underwood.	Cut underwood in 1905, and fell all bad and mature standards. Plant ash, oak and larch saplings to replace standards. Refill blanks in underwood with ash and alder.
Lower Beer Plantation	2	8	Continuation of 1 to west of watercourse. Clay soil.	17	Some larch poles have suffered from wind, otherwise like 1. Many oak standards about 2 feet in girth.	In 1905, cut out bad larch, replant with ash, oak and alder. Cut out bad standards, and prune promising ones.
Tilery Covert A.	3	50	Between the railway and High Down. Clay soil.	26	Ash and oak standards over underwood with some fine larch and isolated branchy Douglas firs.	Leave larch to mature. Thin if necessary. Cut underwood in 1907-9. Then remove branchy Douglas fir and any bad standards. Replant as in 1 and 2.
Pugsleys Hill Copse	8	6¾	West of High Down. Loamy soil.	28	Young poles of oak and ash. Planted in 1876. Good growth over mixed underwood. A few Scotch pine and larch.	Cut the underwood in 1905. fell conifers and replace with oak, ash and alder. Fill in any gaps in underwood.
Gowlersmoor	11	29½	On N. & S sides of railway. Up Bushton Water slopes down to railway.	26	Oak and ash standards over underwood, about 3 acres blank, and there are some worthless Spanish Chestnut.	Blank should be planted in 1905 with oak, ash and alder. The underwood should be cut in 1910, as well as bad standards, including chestnuts. Plant sufficient oak, ash and alder to replace felled trees and any gaps in underwood.
Tadiport Wood	31	2¼	Isolated plot east of watercourse opposite Accott Wd. W. aspect but sheltered loamy soil.	5	Ash poles with a few branchy oaks over underwood. At N. end a few larch abut.	In 1919, fell all bad standards and cut underwood. Plant chiefly ash for standards and alder for underwood. Preserve all ash saplings when cutting underwood.
		108½				

IV.—WORKING-PLAN FOR ALICE HOLT FOREST.*

By W. Schlich, C.I.E., F.R.S.

This working-plan, a copy of which was kindly sent to our Society by Mr. E. Stafford Howard, C.B., Commissioner of Woods and Forests, forms a compact little octavo pamphlet of 33 pages, of which 13 pages are devoted to the detailed description of compartments, here termed inclosures. The field work was done, under Dr. Schlich's direction, by Mr. W. F. Perrée, Deputy Conservator of Forests, Assam, a former student of Coopers Hill, who was home on leave in 1903.

The Alice Holt Crown Woods, 1600 acres, were enclosed from 827 acres of surrounding wasteland, in 1812, in order to produce oak timber for the Navy, by Act of Parliament. The wasteland then became the property of persons having rights-of-common in the old forest, of which the present Crown woodland formed part. It was provided, after the passing of the Act, that no rabbits should be kept in any part of the wood, on any account or pretence whatever. This part of the Act has however been ignored and in 1897 all natural regeneration had been destroyed by rabbits. Recently, however, rabbits are being kept down, and it is to be hoped that they will soon be exterminated. Besides the enclosure made in 1812, 284 acres of land, the original freehold of the Crown, has been included, to make the total area of woodland under the working-plan 1884 acres.

*London: Printed for His Majesty's Stationery Office. Darling & Son, Ltd., 34-40 Bacon Street, E. The report of the Working-Plan costs 3d., and the Map 2s., and may be obtained at the Office of Woods, &c., 1 Whitehall Place, London, S.W.

The woods are composed almost entirely of pure oak; they have been much over-thinned, and are now 70 to 80 years old. The altitude varies from 230 to 400 feet, and the land is on the Gault, forming a clayey soil with little humus, except to the N.E., where the soil is sandy. The soil-covering consists of bracken, brambles and weeds, the woody undergrowth being destroyed by rabbits.

The woods are classified, by area, as follows:—

Divisions of the Woodland.	Oak Woods. Mean height of oak.				Coppice	New coniferous planting since 1866.	Grand totals.
	60 feet & over.	40 ft to 60 ft.	Under 40 ft	Totals.			
Ordinary Inclosures ..	297	851	293	1441	1	47	1489
Lodge Inclosure .	18	295	38	351	30	14	395
Grand totals	315	1146	331	1792	31	61	1884

The object of the working-plan is:

1.—To make the most of the woods, financially, without any special preference for immediate over future returns.

2.—Due regard must be paid to the supply of available labour, which is at present small, owing to the extensive works on the neighbouring military camp in Woolmer forest.

3.—The best possible object lesson is to be given by the scientific treatment of the woods.

4.—The amenities of the Lodge Inclosure must not be interfered with, as the tenant of the lodge has a lease of 41 years.

A careful estimate has been made of the value of the standing oak, which is £95,020. Since the woods were planted, thinnings made between 1847 and 1904 have yielded £70,467, so that the total production of the area since it was planted is £165,486, giving an annual average return of £1 1s. 0d. per acre.

The new plantations, formed since 1886, consist of larch, Scots and Corsican pine, spruce, silver-fir, and Douglas fir. Thinnings will commence on these when they are twenty years old. All the coppice, except that under ash, which pays well, will be converted into coniferous woods.

The plan proposes to deal with the oak woods as follows:—

1.—First-class oak woods, with a mean height over 60 feet.

The 297 of these first-class oak woods are insufficiently stocked, there being only 63 trees per acre. These will be further reduced in number to 45 trees per acre, by cutting out unpromising trees. They will then be underplanted with beech. Any blanks that occur will be planted with larch or Douglas fir. It is intended to complete this work in 20 years, by dealing with 15 acres annually.

2.—Second and third-class oak woods.

These woods, comprising an area of 1144 acres, are to be dealt with in 60 years, viz., 300 acres in the first 20 years, and 844 acres in the following 40 years. All good patches of oak wood will be treated as the first-class oak woods, and the inferior patches will be cleared and restocked with spruce on the clay, and with Scots, Corsican and Weymouth pines on the sandy soil. Ten per cent. of larch may also be introduced, and a moderate amount of Douglas fir, in sheltered situations.

Special treatment is to be afforded to the Lodge Inclosure, by working all the woods in it, except the coppice, under the selection system.

The mode of treatment to which this forest is to be subjected has been well considered, and it will now have the great advantage of being managed continuously on a plan drawn up by a first-rate practical forester. Mr. Stafford Howard has now secured good working-plans for the High Meadows Wood, near the Forest of Dean, and for Alice Holt Wood, and it is to be hoped that working-plans may eventually be drawn up for the enclosed parts of the New Forest, for the better parts of the Windsor Forest, and for the other outlying woods in the Crown lands.

V.—"THE TREES OF NORTH AMERICA."

Review by Dr. A. Henry.

The most important book on trees published during the year has been Sargent's "Manual of the Trees of North America."* It is a handy volume, printed on thin paper, of about 800 pages, giving an account of all the trees of the United States and Canada, those of Mexico being excluded. Over 600 species are dealt with, each being illustrated by a small wood-cut.

Sargent's monumental work, in 14 quarto volumes, the "*Silva of North America*," owing to its immense size and great cost, is totally out of the reach of most readers. It was a happy thought to condense it into the cheap and portable volume now before us. The latter, however, is not a mere abstract of the larger work, as with it have been incorporated all the new species which have been discovered of late years.

All the synonymy and bibliography, much of it of mere academic interest, is entirely omitted in the Manual; and this was of course inevitable in a measure. Difficulties will arise however with English readers, in identifying some of the species, which happen to be known in this country under other names than those adopted by Sargent. The hickories are put under the genus *Hicoria*, the familiar *Carya* not being even alluded to. *Thuya gigantea* appears as *Thuya plicata* without any explanation. Other cases might be adduced which will certainly puzzle the non-professional botanist or general reader. At the expense of a little inconsistency in the plan of the book, it would have been advisable to have given, in the case at least of the more important trees, the synonyms

*Houghton, Mifflin & Co., Boston and New York. 8vo., price $6.

which are in actual current use in the ordinary text books on forestry and arboriculture. These synonyms would not have been very numerous; and their insertion need not have increased the size of the volume appreciably.

The descriptions, distribution, etc., are full and accurate, it is needless to say. The keys which head each group of species are based on characters taken from the fruit and flowers as well as from the leaves. Trees, as a rule, only flower when they have reached a considerable age, and in the case of cultivated specimens of many American trees in this country, flowers and fruit are often never produced at all. If the keys had been entirely based on the characters of the leaves, shoots, and buds, they would have been of much greater service, not only to the forester in Europe, but also to the field botanist in America.

VI.—"THE FORESTER."*

Review by A. C. Forbes.

The first edition of "The Forester," by James Brown, of Arniston, appeared in 1847, and this book, with its several editions, was considered the practical foresters' text-book for many years. In 1894, an enlarged edition of "The Forester," edited by Dr. Nisbet, was published by Messrs. Blackwood & Sons, and which chiefly differed from the edition edited by Dr. James Brown in containing a large number of notes on Continental forestry, with which the original author's and his editor's opinions and statements were compared. The two volumes just issued bear Dr. Nisbet's name as author, but the reader may have some difficulty in deciding whether it is intended for a new book or a new edition.

In the Preface, Dr. Nisbet states that "this edition is really a new work, in which is incorporated in a condensed and improved form, the essence of all the other books I have written on forestry during the last thirteen years, together with much original matter dealing specially with conditions in the United Kingdom. The only portions where any resemblance to Brown's 'Forester' could still be retained are the 'British Sylva,' 'Concerning Arboriculture,' and some of the details concerning fencing."

The author might also have added, with equal justice, that the book also contains a great deal of unoriginal matter, for much of it is made up of extracts from works, articles, or essays by various writers, which have been published in Great Britain during the last twenty or thirty years. This being so, one is inclined to wonder why Dr. Nisbet did not strike out purely on his own account, and by adopting a new title, and omitting the two or

* "The Forester," by Dr. John Nisbet. 2 vols. Wm. Blackwood & Sons, 1905.

three scraps of the original Brown which have been introduced into the present work, write a really new book which would have fulfilled his intentions (as stated in the Preface) "to produce a book dealing chiefly with British Forestry and Arboriculture."

To come to the book itself, it may be mentioned that the general plan adopted in the edition of 1894 has again been followed. Part I. deals with the History of British Forestry and its present extent and condition. The legislation affecting Royal Forests from the time of the Saxons down to the last century is comprehensively dealt with, but with regard to estate woodlands the author appears to have overlooked several causes which had much to do with their development between 1760 and 1820, such as the influence of the natural style of landscape gardening, and the increasing prosperity of landed proprietors about that period.

The author also asserts that the State is the only landowner "that never dies" nor is called upon to pay estate or succession duty. This is hardly correct. The Corporations of several of our large cities now own large tracts of land intended for planting, and these, together with woodlands owned by colleges, hospitals, public companies and bodies, and those on the estates managed by the Ecclesiastical Commissioners, are equally as favourably situated in this respect as the Crown woods.

A great deal of fault is found with the composition and doings of the Departmental Committee on Forestry of 1902. The author complains that it was composed mostly of officials and ex-officials, and that it was characterised by narrowness and official reticence, while landowners and business men were not represented. Those who take the trouble to wade through the mass of evidence collected by this Committee can form their own opinion about this, but it is significant that several of the suggestions embodied in its Report have already been given effect to, which is more than can be said for many Reports of this kind. In connection with this Committee, Dr. Nisbet has taken the trouble to investigate the evidence of Dr. Schlich regarding the figures quoted with reference to the Antonsthal Range (Page 75 of the Minutes of Evidence) and finds that they are above the average. Possibly this is so, but the suggestion that they are misleading on that account does not appear to be substantiated from a perusal of the evidence.

Some interesting figures are given regarding the yield of sample plots in Ireland; while on the subject of forestry education the author has naturally much to say. Most practical men will agree with the statement that "It is not in the least necessary that the forester should be a botanist, a geologist, an entomologist, a chemist, or a mathematician—indeed, it is of far greater importance that he should be a practical man with a fair share of common sense." As regards the education of the landowner or agent, a course of 100 to 120 lectures of one hour each is considered necessary, with five or six excursions to woodland centres on alternate Saturdays, or preferably ten to twelve weekly. The author insists that this course should be given only between April and October, as botany and entomology are best studied at that season. It may be pointed out, however, that many forest operations, such as planting, nursery work, etc., cannot be favourably studied in the summer months, while a great deal of botany and entomology can be done in winter equally as well as in summer.

In Part II. (The British Sylva) the broadleaved trees and conifers are dealt with in detail. As regards the former, few species mentioned can be objected to, but amongst the conifers many species are included which are only of slight arboricultural interest, such as *Pinus montezumæ*, *P. rigida*, etc. Several statements are made which are hardly in agreement with the experience of British foresters, as that of the Austrian pine being less hardy than the pinaster, or that Corsican pine is not adapted for clay soils. The author also states that Mr. Elwes of Colesborne has sold trees of the Black Poplar *(P. nigra)* for £5 each, whereas the trees actually sold were, if we are not mistaken, Black Italian Poplars *(P. canadensis)*.

Part III. (Sylviculture) contains a vast amount of useful information, but one misses any adequate allusion to a subject which is engaging the attention of many South country landowners and foresters now-a-days, viz., the conversion of coppice into high forest. In condemning slit-planting, Dr. Nisbet quotes Schwappach's opinion of this system, but it is doubtful if bad slit-planting is worse than bad planting by any other method, and if carefully slitted in, the root of the trees are not necessarily forced into an unnatural position, as is here stated. A man, however,

who is expected to slit about 1,200 to 1,300 plants in a day, can hardly be expected to plant carefully, and the desire for speed rather than careful work is one of the chief causes of failure.

In Chapter VI., Brown's original diagrams of plantation boundaries, etc., are still used, and little new matter is added to what is termed "arboriculture." In condemning hedge-row timber, the author fails to sufficiently recognise the importance of this class of timber in the South of England. Few landowners would care to cut all their hedgerow timber in rich grazing districts, and plant shelter-belts in its place, while the statement that oak makes the best hedgerow tree may be questioned.

Vol. II. contains parts devoted to "The protection of woodland," "management and valuation of woodland," and "The utilisation of forest produce." The first of these deals with injurious animals, insects, and fungi, and other ills to which timber is heir. That prominent scourge of British woodlands, the larch disease, hardly meets with the special attention it deserves, and one finds nothing but the usual stereotyped account of the disease. The author has evidently not thought it worth while to include the findings of the committee of enquiry appointed by the Royal Scottish Arboricultural Society to investigate this disease.

Part VI., dealing with woodland industries, describes many which are not likely to be introduced into this country for many years, although the accounts of them are very interesting. Such British industries as hurdle-making, etc., are dismissed in a single paragraph, while several pages are devoted to tapping for resin and similar unknown industries in these islands.

Although many points in this work have been criticised, it is rather because the author has been taken at his word, and the book reviewed as a British text-book, than on account of any serious defect in it. The many illustrations are very good, the text clear, and the general get up of the whole work does no discredit to the publishers. As for the author, the amount of time and labour evidently bestowed upon the book, will be fully recognised and appreciated by all interested in British forestry, and a place found for it on their book shelves.

VII.—THE DISPOSAL OF FOREST PRODUCE.

By Mr. D. Mc.Beath, Abbey Village, Withnell, Chorley, Lancs.

Awarded Silver Medal.

It is estimated that there are 3,000,000 acres of woodland of sorts in Great Britain and Ireland. These woods do not lie in one compact area, being in scattered blocks and belts all over the country, and are composed of variously mixed stands of timber. They are partly owned by the Crown, private proprietors, and public bodies. Of this area of woodlands about 67,000 acres belong to the Crown or State, and are located in nine different counties. The bulk, however, of the woods and forests is owned by private proprietors, and omitting small properties, vary from one hundred to several thousand acres in extent. The largest areas of woods owned by private individuals are found in Scotland, and on a few large estates the mass of these woods and forests resulting from private enterprise was planted with a view to the production of timber, forming a continuous forest varying in extent from 10,000 to 20,000 acres. In nearly every county in Great Britain there are a few proprietors who own from 500 to 5000 acres of woods, while there are a greater number of smaller estates scattered throughout the country, contributing to form a large part of our woodlands with areas varying from 100 to 500 acres of woods, of which much is inferior, and their present unsystematic condition renders them scarcely worth consideration. On such estates timber may only be offered for sale once in a life-time. In remote localities, where the grower has to bear the expense of long hauls, little of the forest produce is utilised through lack of means of transporting it to the outside world.

Woods owned by public bodies are neither extensive nor numerous. Of late years, Corporations have been buying up their watersheds or catchment areas, as a means of preventing defilement of their water supply. The catchment or drainage areas contributing to the storage reservoirs in Great Britain amount to about 576,000 acres, and are under the control of and partly owned by public bodies or waterworks authorities. For the most part these catchment areas are in remote, hilly districts, sparsley wooded, but well adapted for growing timber.

Past Management.

The owners of private woods have a right to adopt any system of management which may suit them best. In the past the timber value of trees was a secondary consideration, and trees were planted for their value for ornament and shelter. But by a proper selection of species a direct profit can also be reaped, as a species which meets commercial requirements will in most cases answer all demands. Woods will naturally become the resorts and homes of deer, game, birds, etc.; and so far as it can readily be done without interfering with forest management these should be protected. But the primary purpose of a wood or forest is a practical one, viz.: the production of timber—and that object should not be forgotten.

On very few estates were the woods managed in the past for the purpose of producing clean and straight grown timber. They were too often regarded as merely the homes of game and vermin, and in some cases the means of furnishing ready cash when wanted.

Predominating Classes of Trees, and Uses to which they are put.

Home-grown timber consists of many varieties, and these varieties are used in various localities for different purposes. The value or usefulness of all timber depends on the distance it lies from a consuming centre, and on the soil on which it is produced. To be of most value, and therefore commanding the highest price, it must be raised on a fairly good deep soil, in an accessible locality, and near a consuming centre.

The most important of these varieties may be enumerated in

the following order, according to their commercial value in this district at the present time, viz.: oak, ash, elm, sycamore, larch, beech, alder, and Scots fir. There are several other kinds, but their scarcity on the market precludes them from occupying any position of commercial importance, while others have been ousted from the market through foreign competition.

Oak.—Commercially, the most important tree of the British Isles is the oak. It may be said to stand at the head of all timber-producing trees. Although the uses to which oak is still put are numerous, it has been supplanted in many cases by other materials, and for shipbuilding purposes it has become almost obsolete. Iron ships have now taken the place of large wooden ones, but quantities of oak are still used in building smaller craft. Great quantities of oak were at one time used in house building, but cheaper imported timbers have largely taken its place, viz.: pitch pine, teak, and Cyprus wood, while a great many other uses for it have gone out of date, such as oak stair-cases, panelling, wainscotting and oak flooring.

A good business is still carried on in supplying wheel-wrights, implement makers, and coach and waggon builders. These trades usually buy the oak in the form of planks, and cut out the scantlings as required. These planks consist of thicknesses from 1½ inches, rising every half-inch up to 6 inches in thickness. Oak felloes are used in some districts of Lancashire for heavy carts and lurrys used in stone quarries; but the general custom is to use these in elm and ash. Large quantities of oak naves are used for heavy wheel making; and timber for this purpose must be sound and free from shakes. There is still a good outlet for clean straight grained timber in the cleft oak spoke trade, although this industry does not flourish to anything like the extent it did formerly. It is not many years since the construction of wheels in this country was entirely confined to home-grown timber. This is by no means the case now. More than half of the wheels now in use are imported, or constructed with imported timber. The imported spokes from Russia and America are produced and placed so cheaply upon the market, and dressed ready for driving into the nave, that the home produced spoke is being driven out of the market. The result of this will be that unless the home timber merchant, or grower, meets the

requirements of the market by putting down the necessary machinery for turning them out in a similar condition, our own produce will be gradually ousted from the market altogether. Wheel-wrights and coach builders cannot afford the time or expense for dressing their own spokes, and demand their timber to be in such a state of readiness that they have merely to put it together. No matter how great the superiority of the home produced spoke may be, there is only an extremely limited market for it unless it is so finished.

Field and entrance gates, posts, and cleft oak pale fencing lead to a large consumption of oak timber annually. Cleft pale fencing is now largely used on estates in the South and East of England, but is not general all over the country. This may be due to the fact that oak suitable for cleaving purposes is not found in all parts of the country.

Ash.—In the field of commerce, owing to its usefulness, ash comes next in importance to the oak. Like other indigenous trees, it is found in considerable quantities, in almost all parts of the country, although not in the same proportion, and its scarcity is much greater than that of other hardwoods. This is due to the demand for it as soon as it reaches any size; being worth more money in a smaller and younger state than any other kind of tree. Ash is the toughest wood natural to Europe. This is clearly demonstrated in the case of young trees grown on suitable soils, and is only surpassed in imported timbers by lancewood and young hickory. The uses to which ash is put are manifold, and exceed those of the oak. It is the most important of timbers in the hands of the agricultural implement maker, wheel-wright and coach builder. Shafts and draught poles are the most profitable uses to which this timber can be put, and the prices realised for good ash shafts are very high, owing to the difficulty of getting them. This has lead to large importations of foreign ash, but good home-grown on account of its superiority can always hold its own. Large quantities of ash are used in building the bodies of carriages, and as a rule the builders buy the timber in the plank, well seasoned, and cut out the scantlings required. More ash is worked into felloes than into any other kind of article. Tool-handle manufacturing also consumes large quantities; and timber for this purpose must be tough, straight grained and free from knots.

Quantities of ash are also used in the furniture making industry, and American and Continental ash are largely sought after by cabinet-makers for this purpose. Its chief quality is that of being easy to work, a great consideration where labour is a costly item. The supply of the best quality of ash is exceedingly scarce, and is not equal to the demand. There is plenty of the inferior sort to be obtained, but it is of no use where severe strain is applied. If clean enough, and free from curls, a great deal of it is manufactured into felloes; but the majority of rough crooked grown ash is almost worthless, although as a last resource it makes excellent fuel.

Elm.—In point of usefulness, next to the ash comes the elm. Its cultivation is fairly general, and it is to be met with in large quantities in nearly all parts of the country.

There are several varieties of elm, but these are broadly divided into two classes for commercial purposes, known as Scotch and English elm. The elm is a tree that plays a prominent part in timber consuming trades, although it does not attain the rank or eminence of the oak and ash.

The number of uses to which it is put may be as numerous as those of the oak and ash, and it is often required in larger quantities, being more wanted in bulk than in individual sizes. Large quantities of elm are used in shipbuilding, and timber for this must be of best quality, and free from all defects. Railway companies use large quantities of elm for waggon building, and a variety of other uses, while it is the chief timber used by the undertaker. The chair-making industry consumes large quantities of elm butts for chair seats, but for these they must be of the best quality, and a good price can be obtained for timber fit for this purpose. Elm is put to a variety of purposes in the wheel-wright and waggon building trades, viz.: shafts, naves, felloes, cart and van sides and bottoms. It is also largely used for pit chocks and foundry wedges. Large quantities of these are often required, and they can easily be cut from odd lengths and tops. Elm is noted for the richness of its grain and colour. Its chief speciality being that it is as durable as ash where no severe strain is applied, and it is a cheaper hardwood.

Beech.—The beech may be considered as being next in importance to the elm, and is found in considerable quantities in nearly all parts of the country. It abounds in the South and East

of England, attaining a great size on chalky soils. Large well-grown clean beech is exceedingly scarce, while there is plenty of small, coarse grown, crooked stuff, which is of little use except as fuel. The best quality of beech timber comes from the calcareous soils of the Chiltern Hills. The chair-making and furniture trades consume large quantities of good beech timber, and it is usually supplied to these trades in the form of planks and smaller scantlings. Canadian birch is gradually taking its place in supplying the furniture trade, as it costs only a little more than half the price of good beech. Table legs are imported ready for the maker; chair parts are also imported fully manufactured for fixing together. A good deal of beech is used for wedges by shipbuilders and large gun-makers, and it is also used for hames and saddle frames, brush backs and tool handles. In some parts of Scotland it is used as felloes for cart wheels. With the clean white appearance of its timber, and the resistance it offers to chopping, it is well adapted for making butchers' blocks and table tops. With the exception of sycamore, it is the chief timber used in the turnery trade.

Larch.—In a great many districts larch comes next in importance to the oak and ash, whilst in many it is even of more importance. Large quantities of larch timber were used at one time in the construction of large ships, but iron has now taken its place. There is still a good quantity consumed in building smaller craft, fishing smacks, and canal boats. In some parts of the country cart shafts are made from larch. It is largely used, when obtainable, for field gate making, gate posts, fencing posts, and railway sleepers, and is considered to be the best timber for pit props and mining timber. Through the utilisation of cheaper and more abundant kinds of trees under preservative treatment, the demand for larch sleepers has fallen off considerably during late years. The timber of home-grown Scots fir, spruce, and Baltic soft woods, when used as sleepers, with proper methods of preservative treatment, is fairly durable; but the wearing away of the softer fibres of these woods under the rail, and the constant friction, enlarges the bolt holes, as a result of which the bolts do not hold with sufficient

firmness to withstand the motion and pressure of the rail against them, and these soft woods cannot be compared with the larch for durability.

Scots Fir.—Of home-grown conifers, the timber of Scots fir may be classed as next in importance to the larch. At one time it was largely used in housebuilding, and a variety of other uses, but the uses to which it is now put are very limited. The chief cause of this is the fact that foreign wood is landed in our consuming centres—not only at seaport towns, but in inland districts—and sold at a cheaper rate converted ready for the builders, and hence has entirely ousted the Scots fir timber from the building market.

The principal outlet for fir timber exists in the supply of creosoted sleepers, fencing posts and rails. The timber of Scots fir and other soft woods impregnated with creosote, zinc chloride, or other antiseptic substances, where no severe strain or wear is applied, can be made to out-last the larch.

Methods of Disposal.

The disposal of forest produce is one of the most important branches of forestry. The forester should know the prices which prevail in the principal distant markets as well as those of the local timber merchant, and have a knowledge of the requirements of the different industries where timber is consumed. He should also know the uses to which all home-grown timbers are put.

It is impossible to lay down a rule as to the best method for disposing of forest produce to obtain its real value when offered for sale. Each wood is affected by different conditions, but there are a few general points which may be discussed on broad lines, and are applicable to all. But so long as each grower markets his own produce, each wood will have to be dealt with separately according to the quantity, quality and species of trees for disposal, and the demand in their local markets. On most estates timber is disposed of in the round. It is sold either by public or private tender, or by auction sale, in lots standing or felled, to suit purchasers. But

these systems cannot be said to be satisfactory. It is no secret that at a great many sales by auction or tender the ring or "knockout" system is extensively carried on. If the auctioneer or seller is ignorant of the actual value of what he is selling, and has instructions to sell without a reserve price being fixed, he is of little use at a timber sale from the grower's point of view, and the timber is practically thrown away.

A few weeks ago a paragraph in the *Estates Gazette*, from the pen of a well-known English forester, dealt with this very subject. In this case, a small parcel of poplar was offered for sale at the exceedingly low price of 2d. per foot, in order to have the timber removed. The timber merchant, or "middleman," offered 1½d. per foot, and no deal resulted. The writer stated that this poplar, when manufactured into scantlings, would be worth from 1s. to 1s. 2d. per foot, and case after case of a similar kind might be cited. The middleman, or local timber merchant, is generally the buyer who invariably makes his own price, who buys to sell over again to the converting merchant or consumer, and who gets the profit the grower should enjoy. On a few estates, where there is enterprise, and the necessary machinery is provided, the forest produce is converted at home; and is disposed of in a semi-manufactured state to the consumers and users, and the price per foot is two to threefold that offered by the timber merchant.

The question now arises whether it is better to dispose of the trees in the round, or to convert the timber at home and sell it in the form of planks and scantlings to suit the consumers. There has been much discussion regarding this, but there can be no doubt that manufacturing the timber is preferable. By this method much wood which would otherwise be wasted, or turned into firewood, will become an important factor in contributing to swell the profits of forest produce. This is particularly demonstrated in coach and waggon building trades by the opening that is offered for utilising the immense amount of oak, ash and elm limbs and tops. Limbs that will square four inches to six inches, and four feet long, are now selling from 2s. 6d. to 3s. per cubic foot. There is a corresponding difference in all other kinds of timber. Manufacturing forest produce furnishes an excellent opportunity for owners of hardwood forests to engage in a sure and lucrative business.

Average Prices that should be obtained for Timber in the Woods.

It is difficult to give an accurate idea of the prices realised by sales of timber in the woods. The quality of the timber varies with the soil in each different locality, and trees may be grown on soils unsuitable for the production of timber of the best quality, thus leaving room for great variation of price.

In some parts of England the system of selling privately is extensively carried on, and it is impossible in such cases to obtain reliable information as regards prices. The systems of measurements are so various that values cannot be quoted with any degree of certainty, and so many conflicting opinions are expressed that it is impossible to arrive at the real existing conditions of the round timber market. From some districts the report is heard that prices are falling, while at the same time from other parts we hear that they have a tendency to rise. The practice on some estates of publishing prices that their oak and ash make, from 2s. to 3s. per foot in the wood, is very misleading. These prices are sometimes realised for good oak and ash butts, but if the whole tree is measured down to six inch timber the average price would be from 1s. to 1s. 4d. per foot. There is more good oak and ash timber sold for 1s. per foot than for 1s. 6d. to 2s.

At the present time, the following prices may be taken as approximate on timber down to six inch diameter :—Oak, from 1s. to 1s. 6d. per foot ; ash, 10d. to 1s. 6d. ; elm, 6d. to 1s. 4d. ; beech, 4d. to 1s. 4d ; larch, 8d. to 1s. 2d. ; Scots fir, 2d. to 8d.

Why such Prices are frequently not Obtained, and sometimes Exceeded.

Timber may be selling at 1s.6d. per foot in one district, and an equal or better quality of the same kind of timber may only realise 1s. in another part. This may be due to different causes, viz. : great distance from a consuming centre, foreign competition, an overstocked market, system of measurement, but chiefly to the lack of organisation amongst growers is due the unsatisfactory condition of the timber trade in this country.

The great distance from a consuming centre operates against good prices. In some cases the hauling distance and cost of

carriage exceeds the actual cost of converted foreign goods, without leaving anything at all for the tree. The fact that our railway companies carry over their lines large quantities of foreign timber at lower rates than the home grower pays for sending his produce to market, is regarded by many as a striking example of the "preference" that is alleged to be shown by them to the foreigners. The real position of affairs in regard to this particular matter is worth examining, and is dealt with later on.

Foreign competition.—Imported timber being so clean grown is superior to our own produce, is more easy to work, and is sold at a cheaper rate than timber merchants can supply the home-grown. It is landed in our consuming centres already sawn into such convenient sizes, that such a thing as waste has neither to be considered nor paid for. Again, foreign timber is carried so cheaply, that it costs less to bring it from foreign forests to inland towns in this country, than it does to place the British grown produce one to two hundred miles distant, in the same market. These excessive charges are transferred to the grower, who receives less for his produce.

An overstocked market.—This may be due to an industrial depression, or the result of a windfall. To the latter, perhaps, more than the former, is often due the conditions of the home timber market. An industrial depression is marked by the falling off in prices of iron, steel, and timber, and there is a slackness in the demand, caused through less competition amongst the consumers and users.

After a windfall, large quantities of storm-felled timber are offered for sale from all parts of the country, the supply exceeds the demand, and timber becomes a drug in the market. A case of this kind may be cited from Ireland. After the severe gale of February, 1903, when more than half the timber in Ireland was storm-felled, the home or local markets soon became "glutted," and there was not sufficient local business to consume one-quarter of the blown timber, the grower was placed at the mercy of the buyer as regards price, and he had to accept what was offered, or leave his storm-felled timber to rot in the woods.

System of measurements and allowances.—All trees should be carefully graded, and measured as to size and quality, and offered for sale in separate classes. It stands to reason that better prices

could then be obtained on the whole, as the buyer could purchase for his actual requirements, instead of the haphazard manner in which it is placed on the market at present. The systems of measurement and allowances are so various that very mistaken ideas are fostered in the minds of those interested in forestry, but who do not deal with practical forest work at first hand. The buyer who has to take a mixed lot of timber, cannot reasonably be expected to give so much per foot as if he were purchasing only what he actually required. It is, therefore, a wrong policy from the grower's point of view to offer timber unassorted.

Organisation Amongst Growers.

The United Kingdom, though in area one of the smallest of European States, ranks foremost in wealth, resources and advancement. It may be said to be the largest timber consuming country in the world. It is, therefore, obvious that the British grower has an unassailable position in supplying his market with those varieties of trees which realise the best prices. Consistent with its progress in other lines, is its present active interest in forestry—an endeavour to make amends for past neglect. But it seems to me that a very important question for home growers to consider is: Suppose we have the timber, how can we dispose of it, or how can we turn it into money? At the present time, growers complain that they cannot get an offer even for very fine timber. What, then, is the use of planting trees if, when grown and offered for sale, no one wants them? The remedy for this state of things is really in the hands of the owners of timber themselves.

Combination amongst the growers is what is really wanted for the prosperity and success of forestry in this country. A Growers' Supply Association should be formed for the whole kingdom. If all growers belonged to one central body, there would be greater economy in disposing of forest produce. Short supplies keep prices high, and improved business connections would result to small and isolated estates.

Railway Rates.

The home grower, with his present small supplies, cannot offer to the railway companies quantities approaching in any degree to

the magnitude of imported timber. He expects to realise the best price for his timber in the market, but he is unable to get his small lots delivered there at the same proportionately low rates as the big foreign importations secure, by reason of their large quantities. Most of the foreign timber that reaches this country is carried a long distance. It fetches such a small price on the market, that the through freight charged for conveyance must necessarily be low, if it is to be carried there at all, and such lowness of freight is held to be warranted alike by circumstances, and by the large quantities in which the timber is imported. Combination is especially desirable amongst growers in order to secure the grouping of consignments into large quantities. Railway companies will then grant similar rates to home-grown as is now done to foreign timber.

A Growers' Association.

This association to be managed by one board of directors, one general manager, manager and secretary at each leading centre, a valuer and buyer for each province, and representatives for all timber consuming trades.

Uniform prices and rules of inspection to be formed at all the leading centres, which would be recognised from north to south. There are a number of small estates widely scattered throughout the country on which timber may only be offered for sale once in a lifetime, making it difficult to organise them. Perhaps the best that could be done, would be to form provincial associations; this in itself would be of great benefit to small growers.

Permanent and temporary saw mills, and wood-working machinery, to be laid down near the chief sources of supply: thus a large saving in the cost of transport would be effected. The growers who are nearest the consuming centres would still get more for their produce than distant and isolated growers. The most up-to-date labour-saving machinery must be used in order to bring the prices more in a line with those of the imported article. A complete stock of all classes of dry timber must be maintained in all timber consuming towns to draw upon.

In every great consuming centre there are a variety of manu-

factures that must be supplied in small or sizeable lots from week to week, which will constitute, to a large extent, a retail trade. It is one in which the consumer wants to make his own selections. There are a multitude of small manufacturers of all sorts, as well as contractors and builders, who desire to resort to stocks that they can see, consisting of ample variety of wood and sizes. Such men cannot buy in large quantities to meet their requirements for a long period. Hence it is necessary to have yard stocks in the consuming centres that can be drawn on at will. Where there is a trade demand, a Growers' Association would cater for it.

VIII.—THE AFFORESTATION OF WATERWORKS CATCHMENT AREAS.

By Samuel Margerison, Grey Gables, Calverley, near Leeds.

[Re-published, with some additions, from "*The Bradford Scientific Journal*," July 1st, 1905.]

This is a matter which has worthily occupied much attention of late. Afforestation has great value in relation to the collection, conservation, and purity of water supply—one of the few absolute necessities of life. It is impossible in a short chapter to go thoroughly into all the details of the subject, but a sketch of some of the principles involved in this particular connection may be useful, coming from one whose daily life is associated with British woodlands.

Corporations owning or possessing a sufficient right over the properties which form their water-gathering grounds, have an almost unique opportunity of profiting from afforestation, under proper and systematic management. They have also therein a great power over the future timber supply of the nation. And in the meantime a valuable opportunity may be afforded for providing a livelihood for properly selected members of "the unemployed" who are really willing to *work*, and to face the conditions of country life, favourable or adverse.

It has for some years been observed by those who have had sufficient training and opportunity for comparing the results from British timber-growing lands with those of some other countries, that the home woodlands have generally been worked on unprofitable principles, especially during the last century or two, and in

view of present requirements. An ideal system of sylviculture takes view over a period longer than that of one or two generations of mankind. Again, the life of a tree, and especially of a forest, if the most is to be made of it, ought not to be subject to the caprices or necessities of an individual. This, to members of a sylvicultural society, has long been evident, but it is herein that the matter is one which is made especially interesting and financially valuable to a non-dying Corporation, which can command expert evidence and advice as to a "working-plan" made to direct the operations on a large scale, and over a long term of years. And a Corporation possesses staying power to enable it to make sure that the resulting crop is not wasted by mismanagement or urgent financial affairs. With the exception of H.M. Government, no British landowner has such a prospect of profiting by the timber famine which experts see looming within almost measurable distance.

The great aim of a Waterworks Committee in buying or otherwise controlling land, is to collect and distribute pure water, and to prevent its pollution by harmful animal, and especially human, excreta. When the land is purchased it is often made derelict, and thenceforth as farm land it brings little or no income. Afforestation will partially compensate for this—not in a year or two, of course, but within 25 or 30 years and onward, a steady income may be expected under proper management and control. Several large Corporations have foreseen this, but so far as I have had the privilege of examining previous efforts, present results, and prospective possibilities, none of them (chiefly, perhaps, because the Committees have not quite grasped its value) seem to have grappled with the matter in as large and masterly a manner as they might do. In the meantime much valuable plant food contained in the hitherto cultivated areas is being dissipated and lost, whereas it might be conserved in the form of timber trees by immediate planting.

The purchasing of the freeholds is a costly thing. And making them derelict destroys a considerable portion of their market value at the time of purchase. But much of this loss may be compensated for by systematic afforestation, and the clothing of the land by woods, over suitable portions, would, as I hope to show, encourage a considerable improvement in the water supply, and would in other ways tend to economy in the whole system of the water-

works. There is no doubt that the afforestation of suitable poor and waste lands on a large scale and under systematic control is, and will be, a paying operation; indeed, it is probably the most profitable method of utilizing them wherever altitude and soil, etc., are not absolutely prohibitive, and it is not easy to define where this prohibition comes. It does not occur upon much of our Yorkshire millstone-grit upland.* But every case requires examination in detail, both as to the past, present, and future. We have tree remains at elevations of 1,300 feet and upwards, in positions which look at first sight hopeless for afforestation now. As yet it appears to be undetermined whether climatic conditions are similar to those in existence when these trees were growing.

In the case of catchment areas, the influence of forests upon water-conservation is an additional and most important factor in favour of planting. The temperature of the soil, and of the atmosphere within and for some little distance above the trees is favourably modified by the operation.

One of the greatest savings to the water supply would be due to the very marked prevention of evaporation of the precipitated rain by sun and wind. The evaporation within a wooded area has been shewn by German observers and others to be less than half of that from similar areas of open ground in the same locality.† And even when we take into consideration also the loss of moisture by transpiration from the foliage of the trees, the balance is greatly in favour of the forest.‡ Forest-litter has an immense power in preventing evaporation from the ground. Again, by the collection and condensation on leaves and branches, of hoar-frost, dew, and fog, a considerable amount of water is brought to the ground by the trees. On a foggy day one often finds a considerable local "rainfall" coming down even from a tree on the roadside.

* By the term "upland," I wish to exclude at present the "moss plateaus," the region of cotton grass, and wind-swept high lands over, say, 2000 feet.

† Everybody has experienced the pleasant coolness of a wood on a hot day. And a further illustration of the difference in evaporation is to compare, as available seats, ten minutes after a rainfall, the soil of a forest and an exposed rock on a hill.

‡ There is, of course, considerable transpiration from *any* vegetative cover of the ground—forest or grass, or even heather.

It has long been a popular idea that forests attract rainfall to a district, and we have many stories as to the serious effects on water supply caused by deforestation. Of late there has seemed to be a balance of opinion as to whether this idea is founded on fact or not. But there is often a truth underlying such a tradition. A few years ago, I was one of the party of the Royal Scottish Arboricultural Society, under the guidance of Dr. Wm. Somerville, on the visit (memorable for its influence on recent British forestry) to the forests of North Germany. Amongst other places, we visited the extensive Luneberg Heath new plantations about Lintzel, where we saw Leeds steam ploughs preparing the land, and where we received several valuable object lessons in sylviculture. But what I wish to refer to at this moment is the result noted as to the apparent influence upon the local rainfall, which is recorded as following upon the afforestation of this district. The observations have been contemporaneously recorded and compared with others made in the surrounding district, so that the factor of possible "secular" changes in the rainfall being the real cause, is almost eliminated. With a gradual increase of forestral conditions there was a regularly increasing rainfall recorded—up to the time when my information ceases—of 22 per cent. within six years, and it has in all probability been still further increased by this time.*

Another advantage given to the water supply by afforestation is that of affording, by the root-piercing of the matted, sodden, and perhaps trodden, upper "soil" strata, a rapid transit of the precipitated rain from the region of "evaporation" through a filtering medium, towards the lower impervious clay and shale strata which determine the horizons of *springs*, and thus giving rise to pure spring water, an ideal "source" of supply.

Another important forestral assistance to waterworks engineers is the prevention of *silt*. Anyone caught in a thunderstorm on one of our high moors, must have seen, as he squelched with sodden boots through and over the heather and the rough mountain paths, that the running surface water is heavily laden

* We were told also upon this year's visit to the Belgian forests of the Royal English Arboricultural Society, that the afforestation of the Communal lands of Rochefort, had increased the precipitation of moisture in the immediate district of the plantations.

with particles of sand, small stones, and peaty humus, being carried down to the streams which supply the rivers below. When the stream is "dammed" either by natural or artificial means, the water deposits its load of detritus in the form of silt, and blocks up the lakes and reservoirs. The amount is often enormous, and at times even huge blocks of rock are hurled down the mountain sides. An instance of this may be seen near to Thirlmere, and recently (in the West Riding) in the results of the "cloud-burst" near Bingley and Ilkley. The heads of our great reservoirs are being very seriously and rapidly silted up, and some day they will cost an enormous sum for cleaning out. Where is the silt to be deposited, so that it is not again quickly washed back? And what are those Corporations to do with it who do not own the adjoining freeholds? "Prevention is better than cure." Herein again, afforestation will prove beneficial. Plantations will prevent or greatly minimise silt-laden surface water rushes, by blocking them and by promoting percolation and filtration. Serious would be the result which might occur from a "cloud-burst" on the "moss moors" of some of our catchment areas.

As to the possibilities of growing plantations on our high moors, a few words may be added. As Dr. W. G. Smith* and others have pointed out, conifers will grow where heather flourishes.† In Yorkshire we have many existing examples to shew that trees will flourish at altitudes of over 1000 feet. Sycamores of a really fine size may be seen in healthy growth at 1300 feet. Even on the edges—rock-bottomed—of peat-moors, isolated specimens longing for mutual shelter, may often be seen around wind-swept farm-houses at high elevations in the very funnel mouth of the upland valley. There are pine plantations on Barden Moor at an altitude of 1360 feet. There is good spruce at altitudes over 2000 feet still further north in this country, and we have seen this on the continent in similar latitudes to our own. The beech will grow

* *Geographical Journal*, August, 1903, and elsewhere.

† This ecological record is worthy of much further record. The work of Dr. W. G. Smith, on the "Botanical Geography of Yorkshire" (Bartholomew and Co., Edinburgh), and that of his brother in Scotland, are of great value in connection with this part of the subject. See also Dr. Smith's article on "Afforestation of Catchment Areas," in the *Scottish Arboricultural Society's* "*Transactions*," vol. 17, p. 86, quoting the work of Mr. W. B. Crump and Mr. Wm. Forbes.

at considerable heights, and its exposure there makes its timber more valuable for its especial uses, than that from lowland trees, because of its extra hardness. Birch is an ideal upland tree, and these "hardwoods" should be grown along the road sides, and in considerable belts between the coniferous plantations as a protection against fire.

One great point to be aimed at is to do the planting thickly and on a large scale, so as to provide mutual shelter for the plants, and also because of the greater economy of working large plantations, and converting large crops of timber on a limited area. This, of course, is now an accepted axiom among modern sylviculturists.

The fear of contamination of the water supply by fallen leaves has been proved to be unfounded.* In the first place, the plantations need not be made nearer than, say, 100 yards or so—according to local circumstances—from the reservoirs and main feeders, the outside trees on the water side of them being selected from "needle-leaved" species, and the intervening space sown with irregular clumps and bands of gorse, heather, and such like shrubby small-leaved plants, in order to form leaf-traps. The mountain-streams in the German forests are beautifully clear and pure. The question of leaves bears more on the mechanical arrangements of the valves than on the "purity" of the water.

The recent researches on forest air, of the Italian bacteriologists Serafini and Arata, have proved that so far as pathogenic ("harmful") bacteria are concerned, the evidence in favour of afforestation is decisive. Pathogenic bacteria are reported to be much more abundant in the districts *around* forests than *within* them. Useful saprophytic bacteria, feeding upon dead matter, are observed in greater abundance within the forest area. Again, the "sour humus of the forest soil is antagonistic to pathogenic bacteria; finally, so far no pathogenic microbes have ever been found in forest soil, hence this soil may be called hygienically pure."† In India the soldiers are withdrawn to the forest stations when there is danger of cholera.‡ Other evidence might be cited,

* See a long correspondence hereon, between the present writer and Mr. J. Simpson in the *Yorkshire Post*, May, 1903.

† Ebermayer, cit. Fernow—"Forest Influences," p. 172.

‡ Fernow. Ibid.

but perhaps it may be sufficient to recall to mind the fact that the water supply of Glasgow, said to be the purest town supply in the kingdom, is drawn from Loch Katrine, which is closely surrounded by woods—"feathered by trees to its water's edge." *

I wish I could reproduce, in some visible form, the sight I once had of a spreading mass of sewage, with its magnificent collection of bacteria, enjoying a luxuriant vitality over a rood or so of land on the watershed of a farm bordering on a great water-supply reservoir. I venture to think that a census of the pathogenic bacteria contained in a tumblerful of that surface stuff, would have been equal to that of 1000 acres of forest!

Taking a general glance at the subject, we can now see that the influence of a forest upon a catchment area is definitely favourable to its value as such. It seems quite possible to me that in the case of a Corporation owning two or three reservoirs within a definite catchment area, afforestation, besides improving the quality of the water, and at a cost of a few thousands of pounds improving the financial yield of the property by timber production, might at the same time save hundreds of thousands of pounds (by conserving, and perhaps promoting, precipitation) in the cost of an additional reservoir. To this we may add the saving of the cost of removing silt, which would be prevented from accumulating to such a large extent as it now does.

Much of the work could be commenced at once upon the more accessible portions of the area. The scheme as a whole, should be formed upon a definite "working-plan," made after a careful examination of the local conditions by practical men. Knowledge of surface and the under-lying rock geology, the present soil conditions, altitudes, rainfall and drainage, wind-pressure, general and abnormal, character of atmosphere as regards contamination from neighbouring towns, the presence or absence of tenant-rights, and their nature and terms, are some of the factors to be taken into primary consideration. The total exclusion of ground game from

* And the members of this Society who visited Belgium this year had the opportunity of seeing the great reservoir on La Gileppe river, which supplies Verviers and district. The whole catchment area is, or is being made to be, covered with forest right to the margin of the reservoir.

the plantations is an absolute necessity. Rabbits and forestry cannot exist together. This, of course, is axiomatic.

The decision as to the species of trees to be planted upon the differently constituted sections is one upon which much of the success of the afforestation depends, from a financial point of view. Whilst it would be educationally valuable to experiment, *with full records*, upon the growing of suitable exotics, especially in the vicinity of Universities making a speciality of the teaching of forestry, it would be well to keep on the whole, to a principle of planting, under conditions known to be favourable to them, of the few species of trees which experience has shewn to be suitable to the district, and especially to those for which it is probable there will be a more or less local demand when their crop is ready for thinning or clearing.

The probable ultimate "destiny of the crop" is another important consideration. And this is one which must be studied when its species is to be decided upon. As a general basis, it may be taken that from the very fact of the waterworks catchment grounds being connected with a populous area, there will often be a more or less local demand for the timber. And, as the cost of carriage of timber is at present relatively high in proportion to its cash value, the question of roads in relation to transport, is an important one. I believe that here again a large and masterly policy will pay, and pay well. Good main roads right up the valleys from the present highways, towards the head of the freehold (perhaps not always quite to its boundary) should be planned; and, under the supervision of men who have character enough to cast off shirkers, gradually made at such times as "the unemployed" are available.

The recent development of road motor waggons is rapidly altering the conditions and cost of carriage. They will be particularly suitable for the conveyance of pit-props and semi-converted timber from plantations direct to the consumer, and perhaps even for carrying timber trees in bulk. This will avoid the frequent handling, costly charges, and irritating details which at present accompany and hamper the dual system of horse and railway carriage of native timber.

A considerable amount of additional profit may be produced, especially where forestry is conducted on a large scale, by the partial conversion of the timber near to where it is grown, so as to

reduce its bulky occupance of space in transport, and a consequent reduction of cost of carriage.* Mr. Joseph Parry, the Chief Engineer to the Liverpool Waterworks, makes the valuable suggestion that, below the "supply" area, the compensation water might be utilized in this semi-conversion of the timber.†

I have only in the space our *Journal* can afford, indicated a few salient points of the subject, but I trust that sufficient may have been said to emphasize its value to our city communities and their governing bodies.

[At the moment of correcting proofs for the press,‡ it may be noted from the Annual Report, just issued, of Mr. Neville Rolle, British Consul General at Naples, on the matter of Coal *v.* Waterfalls as sources of power, that the Government of Italy has in hand a scheme to be undertaken on a large scale, for the re-afforestation of the hills in order to largely increase the water supply of the kingdom. In a limited way, in fact, this has already been tentatively begun.—Compare the utilization of water power in the U.S.A.]

* See my papers on "British Sylviculture," British Assoc. (Bradford) Meeting, 1900, and "Timber Transport," British Assoc. (Glasgow) Meeting, 1901.

† "Minutes of Evidence, Departmental Committee on British Forestry," 1902. And surely the resources of science and practice are now quite equal to providing full safety, if necessary, in doing this work, even *above* the line of demarcation thus indicated.

‡ February, 1906.

LOCAL MEETING AT MORPETH.

On Saturday, June 10th, 1905, a meeting of the local members of the Royal English Arboricultural Society was held at Morpeth, arrangements having been made for the visitation of Bothal Woods and Castle, the interesting grounds at Bothalhaugh, and the Experimental Farm of the Northumberland County Council at Cockle Park, the necessary permission being kindly granted by His Grace the Duke of Portland, the Hon. and Rev. W. C. Ellis, and the Northumberland Education Committee respectively. As befitting the fact that it was the first Local Meeting that had taken place since His Majesty King Edward VII. had bestowed upon the Society the proud and well-earned title of "Royal," there was a capital turn-out of members, amongst those present being:—Mr. T. Bell, Acklington; Mr. R. T. Benson, Darlington; Mr. Thos. Bond, Lambton Park; Mr. J. Bowker, Darlington; Mr. Alderman Carrick, Harrogate; Mr. Thomas Clark, Hexham; Mr. W. Clough, Gateshead; Mr. Geo. Cooper, Gateshead; Mr. Bernard Cowan, South Shields; Mr. T. A. Crombie, Morpeth; Mr. Alfred Currie, Newcastle; Mr. R. H. Ellison and Miss Ellison, Witton Gilbert; Mr. John Ferguson, Newcastle; Mr. A. C. Forbes, Newcastle; Mr. Fleming and Mr. W. Fleming, Tudhoe; Mr. W. Graham, Alnwick; Mr. Jos. Graham, South Shields; Professor Douglas A. Gilchrist, Newcastle; Principal J. Smith Hill, Aspatria; Major Harlam, South Shields; Mr. J. J. Kimm, Humshaugh-on-Tyne; Mr. T. W. Luke, Hexham; Mr. A. Mc.Kechnie, Alnwick; Mr. J. C. Maudlen, Newcastle; Mr. P. Mc.Andrew,

Prudhoe; Mr. Wm. Milne, Hexham; Mr. J. Milnthorpe, Newcastle; Mr. John Moult, Gateshead; Mr. W. Ormiston, Langley-on-Tyne; Mr. Robert Purvis, South Shields; Mr. R. Robinson, Morpeth; Mr. R. Robson, Newcastle; Mr. C. H. Sample, Matfen; Mr. Ed. Shipley, Darlington; Mr. Geo. Short, Gateshead; Mr. John Shorte, Cramlington; Mr. Ed. Slater, Newcastle; Mr. W. Smith and Miss Smith, Barrasford; Mr. S. Smith, Spital, Haltwhistle; Mr. and Mrs. R. G. Surtees, Barrasford; Mr. John Taylor, Newcastle; Mr. and Mrs. John Taylor, South Shields; Mr. R. Taylor, Cornhill-on-Tweed; Mr. N. Temperley, Gateshead; Mr. F. J. Thomson, Carlisle; Mr. John Todd, Haydon Bridge; Mr. M. Walton, Haydon Bridge; Mr. Jas. W. Watt, Mr. A. Penton Watt, Carlisle; Mr. N. J. Wright, Morpeth; Mr. A. Wright, Felton; Mr. Edward Davidson (Assistant Secretary), Haydon Bridge, etc.

Brakes were in waiting at Morpeth station, and a pleasant drive landed the company at Bothal village, where Mr. J. S. Clark, the Duke of Portland's bailiff for the Bothal estate, was in waiting to receive them. Bothal village is a model one. The cottages, built of stone, are commodious, comfortable, and at the same time picturesque, and surrounded as they are by pleasant gardens the village gives a most grateful impression of neatness and beauty.

No time was cut to waste, and under the able guidance of Mr. Clark, the party moved off to inspect the Bothal woods. These are of considerable extent. They practically surround the village, and as this is only some 40 feet above sea level it will be rather sultry in summer time. Through the wood behind the village some fine beeches were noted, and then we passed on to one of the woodland paths beside the winding Wansbeck, here a slowly-moving river. From thence our route was across the haugh land, where horses, cattle and sheep were all peacefully grazing, to the oak wood, one of the sights of Bothal that appeals most to arboriculturists. Mr. Clark explained that this wood was planted in 1826, during the time of the fourth Duke of Portland. It was first trenched and was then given a dressing of 40 bushels of half inch bones to the acre. It was next sown with rape and eaten with sheep. In the following year it was formed into lazy beds and planted with acorns. For the next ten or twelve years it might have regular culture and thinning, and then only the

ordinary attention that a plantation would get. They now had a very fine specimen of an oak wood, nearly 80 years old, and it was especially interesting as showing what could be done in the way of raising oaks in the early part of last century. The soil was of a stiff nature and nearly all clay. He knew all the Welbeck woods and they had nothing better than that, indeed they had nothing so good at the same age. The cost of trenching was about a shilling per rood, and the total cost of manuring and planting, under £5 an acre. Of course, labour was cheap at that time. Many of the trees are now 80 feet in height. They were greatly admired by the visitors, alike for their uniformity in height, and the length and cleanness of their boles. When thoroughly matured the timber in this wood, which is some 50 acres in extent, should be of immense value. The oaks are mostly of the Sessile flowered variety, but there are also specimens of *Q. Pedunculata*, with some intermediate forms.

Another walk through the beautiful woodland paths brought us to the suspension bridge just beside the picturesque stepping stones, and here the Hon. and Rev. W. C. Ellis was in waiting to conduct the party over the grounds of Bothalhaugh. It was unfortunate that the visit to the Bothal woods had to be curtailed, for they were at their very best, and the wealth of their varied and tinted foliage made up a picture of great beauty. They run almost down to Morpeth, and as there is a public path through part of them near to the river, this is, naturally, a very favourite walk of the townspeople. Across the swaying suspension bridge the party made its way in somewhat timorous fashion to find itself in the beautiful grounds of Bothalhaugh. Our cicerone was Mr. Ellis himself, an enthusiastic arboriculturist and horticulturist, who delighted his visitors not only with the beauty of his grounds, the rare trees and shrubs that he was able to show them, but also by his extensive technical knowledge as displayed in his most informative and interesting description of all that was to be seen in these very remarkable grounds. The grounds have been formed in terraces on what was, previous to Mr. Ellis gaining possession, simply an ordinary wooded hill-side. Having built himself a very handsome house, Mr. Ellis proceeded to lay out his grounds, and the success of his methods and the highly satisfactory and beautiful results appealed to all his visitors, both

those who had come out for the pleasure of the outing, and those who, in addition, had the advantage of expert knowledge.

It is impossible to indicate in a sketch of this character all that was to be seen in these grounds. The collection of conifers is especially remarkable, while the specimen trees were of such variety as to appeal to all present. They could only have been brought together with great trouble and expense, backed by an enthusiasm that nothing could daunt. Some very fine specimens of the *Abies amabilis* from Vancouver were seen, and near to the rare Chinese blue Juniper. In pointing to a group of Oriental planes, Mr. Ellis said that while they did well in London, somehow or other they did not do well in the north. Fine specimens of the *Cedrus Atlantica* and *Cedrus Libani* were noticed growing together, while there were some particularly good specimens of the upright growing oak. These were all observed on the terrace near the river, which made a beautiful picture, the coloured thorns being in full bloom. Turning from here to the first terrace above, the company got a better view of the blaze of colour presented by the thorns. They extend for a full quarter-of-a-mile, the bushes being in many cases over 12 feet high. There are some 70 varieties, both single and double, and the colours range from white to the deepest crimson. The thorns are interspersed with the Japanese crab, and presented a sight to be remembered. A unique plant was here observed. It was the *Gunnera,* from South America, and the leaves, when fully expanded, are often seven or eight feet wide. Here, too, was observed a particularly fine specimen of the tortuous thorn, and on the same terrace some thorns of the cock-spur variety.

A very pretty brake of Japanese primulas, against a background of golden willow, attracted attention, as did a fine specimen of the tricolour beech, and a well-grown Bashford willow. Among other trees noticed were fine types of Young's golden spruce, Turkestan poplar, variegated chestnut, cut-leaved oak, and weeping oaks and larch. There were fine clumps of the *Cupressus Lawsoniana*, as well as *Williamsonii*, with its white tip, and *Albertiana*, with its yellow tip. There were also groups of the yellow, purple and

lemon elm. *Abies nobilis* was here seen growing well, though somewhat exposed; and then the attention of the company was drawn to a fine clump of Japanese larch. Mr. Ellis said they were twenty years old, and most of the experts agreed that they were the largest and finest to be found in the county. Mr. Ellis said they were much more given to branching than were the European varieties. Then were noticed some deodars and some pretty variegated Siberian dogwood. Beside some large-leaved service trees attention was attracted by a fine lot of *Aquilegia* (columbine), the colours being choice.

Along the path to the house were noticed well grown specimens of the sycamore and elder. The house itself is a modern structure of red sandstone, warm and comfortable looking, and not without some taste in design and treatment. On the lawn was noticed a wide spreading purple beech of particularly graceful shape; but there was little time left now, and the inspection of the remainder of the beautiful grounds had to be somewhat hurried over. However, there was time for a walk over the grounds on the other side of the house that slope, at varying angles, down to the river. Mr. Ellis is an extensive cultivator of roses, and a profusion of bushes were seen, though not yet in flower. Many interesting features were noted as they were pointed out by our guide, and of these mention must certainly be made of the growing bamboos, in which he naturally takes a great pride, and which, after several attempts, he has now apparently succeeded in acclimatising. Down by the river, well sheltered, were some noble specimens of the *Abies grandis*, and at the end of this delightful ramble a decided novelty was pointed out in the shape of a two-coloured laburnum. It was unfortunate that time did not permit of a more exhaustive examination of these grounds, which, in some respects, are among the most instructive and interesting that have been seen on any of the occasions when local excursions had been held. Before we left the grounds of Bothalhaugh,

Mr. Bernard Cowan said: We have had a very pleasant morning, and I think we cannot do less than express our appreciation, in a very hearty vote of thanks, to Mr. Ellis for the

great kindness he has shown in conducting us over his very beautiful and interesting grounds. We cannot have a better object lesson of what was possible to energy and knowledge than what we have seen this morning. I have much pleasure in moving a very hearty vote of thanks to Mr. Ellis for his kindness. (Applause.)

The Hon. and Rev. W. C. Ellis said he thanked them very much for their vote of thanks. He was very glad indeed to have conducted them over his grounds. (Applause.)

Luncheon was then served in the Village Hall at Bothal, Mr. Bernard Cowan, a Vice-President of the Society, occupied the chair, and after lunch gave the toast of "The King" He said they had met under the most auspicious circumstances, for His Gracious Majesty had recently conferred on their Society the great honour of a Royal Charter. (Applause.) It was a gracious action on the part of His Majesty, and one that was highly appreciated by every member of that Society. His Majesty was a very keen arboriculturist himself, and no one was more interested in his estates than King Edward was. He spent money freely, and no one provided a more noble example in the science of arboriculture than did His Majesty the King. (Applause.)

Mr. Wm. Milne proposed the toast of "His Grace the Duke of Portland," and said their visit to the woods and grounds of Bothal Castle had proved most interesting. The Duke had a considerable knowledge of arboriculture, and he was in every way a most considerate landlord, as witness the handsome way in which he got up an agricultural show in that district, one of the best agricultural shows to be found in any county, and they must also remember that the Duke had entertained that Society at Welbeck, and they were very much indebted to him for the privilege of visiting his estates. (Applause.) He had pleasure in proposing the toast of the Duke of Portland, coupled with the names of Mr. Sample and Mr. Clark. (Applause.)

Mr. C. H. Sample said, that on behalf of his father, he had very great pleasure in responding to the toast. He was very sorry that his father, through ill-health, was not able to be present with them that day. He had hoped to have had that pleasure, and he

was sure he would be gratified to hear that they had enjoyed their visit. His Grace the Duke of Portland was one of the model landlords of the kingdom. No man, in any position of life, had more the interest of agriculture at heart than he had, and no man had gained the esteem of his tenants more than His Grace had done. He was glad they had enjoyed their visit to Bothal, which was a small oasis in a desert of pits. They considered it a very beautiful little spot themselves, and he was sure his father would hear with pleasure that they had enjoyed their day. (Applause).

Mr. J. S. Clark said he heartily thanked them for associating his name with the toast. It had given him great pleasure in assisting to arrange for their visit to Bothal. He had lately been reading, in a History of Northumberland, a report by a Mr. Carnaby of a visit to Bothal. That was in 1576, and it was then referred to as a place of fair gardens and fruit trees. That was 300 years ago, but still he thought there was some credit to be given to the generations that had lived since then. He was pleased to think that the Royal English Arboricultural Society had considered Bothal worthy of a visit. (Applause.)

The Chairman then proposed that Mr. Clark should be made an honorary member of the Society in recognition of his kindness and courtesy. (Applause.)

The members then made for the brakes, time not permitting a visit to the fine old Castle, nor yet to the no less interesting old Church, for Cockle Park had yet to be visited.

The brakes were then once more loaded, and a pretty drive brought the members to Cockle Park Tower, where Alderman Carrick, the Chairman of the Farm Management Sub-Committee of the County Council; Councillor C. H. Sample, one of its members; and Professor Gilchrist, were waiting to receive the visitors. There is much of interest to be seen at Cockle Park, and as there has been a good deal of controversy in recent years as to whether the County Council had been well advised in their action, it is perhaps as well to give, as we do below, some of the reasons that have led that body to establish this experimental farm. Some agriculturists have gone so far as to assert that the farm is of no practical use to the farming community, others assert that

too much money is wasted upon it, and that it should be worked so as to make it in some sense self-supporting, while others claim that while English agricultural methods continue so far behind those of our continental neighbours, experimental farms, where scientific methods are freely adopted, are a necessity for the education of the budding agriculturist. There is no doubt that Cockle farm has been very freely visited since its establishment, and on the occasion of which we write there seemed a consensus of opinion that the experiments being carried out were of much value, those devoted to forestry, of course, specially appealing to the visitors on this occasion. This much can safely be said, that experiments such as are being carried out at Cockle Park could not be proceeded with unless the County Council subsidised the farm in the manner they are doing. Criticism they must naturally expect; the valuable information they have so far been able to give to agriculturists is the best reply to that criticism.

In a memorandum issued in 1904 with reference to the County Demonstration Farm, the County Council state:—"In 1891, the County Council of Northumberland agreed to make a contribution of £500 a year towards the establishment of a Department of Agriculture and Forestry in the Durham College of Science, Newcastle-on-Tyne. The establishment of local stations for manurial trials and demonstrations was an important branch of the work of that Department, and in 1896 there were forty-six local stations in the counties of Northumberland, Durham, and Cumberland, comprising 817 demonstration plots, covering a total of 90 acres. It was, however, apparent that valuable as the results obtained at local stations might be, there was a definite limit to the extent to which experiments could be carried under the conditions available. Landowners and farmers were very ready to co-operate in the work up to a certain point, but for many investigations of importance to agriculture it appeared to be essential to secure facilities which it was difficult to obtain on an ordinary commercial farm. It was, therefore, determined to take steps to acquire a suitable farm on which, with land and labour under their immediate control, the committee could systematically carry out experiments and demonstrations with both crops and stock. In 1896, therefore, the County Council secured the farm of Cockle Park, which is about 400 acres in extent, on lease for

21 years, with the object of carrying out demonstrations and experiments under careful supervision. The farm is not a commercial undertaking, but an educational institution, and is chiefly devoted to (*a*) demonstrations of important processes in the practice of manuring, tillage, and cropping of land, particular attention being given to the economic improvement of poor grass land; (*b*) feeding experiments to demonstrate the relative value of food stuffs, and systems of feeding for farm stock. The farm is maintained at the cost of the Northumberland County Council, and is managed by a Sub-Committee of the County Education Committee, the scientific direction being entrusted to the Agricultural Department of the Durham College of Science, Newcastle-on-Tyne. Dr. W. Somerville (now an assistant-secretary at the Board of Agriculture) was responsible for the inauguration of the enterprise, and for the first four years of its development. His work was then carried on by Professor T. H. Middleton, until his appointment to the Chair of Agriculture in the University of Cambridge, when he was succeeded by Professor Douglas A. Gilchrist. The County Council has expended about £3,500 in the equipment and stocking of the farm; and the expense of maintenance, excluding the cost of scientific supervision, has been £800 a year, towards which the Board of Agriculture has made a contribution of about £200 a year."

The party first viewed the experimental fruit plantation which adjoins the Tower. Forty-three varieties of apples have been planted in the form of half-standard, bush and pyramid trees, and three varieties of plums, also pyramid trees. The trees and small fruit have made satisfactory growth, but as yet no definite results can be tabulated with regard to the most suitable varieties.

Thence to the forestry plots was the order, and these attracted much attention. On the southern portion of "Broomy Hill" ten plots of ground have been laid off and planted with forest trees for the purpose of illustrating certain principles of sylviculture. In the first plot, Norway spruce and ash, representing a mixture of shade-bearing and light-demanding species, the spruce has done well, but the ash has been checked by late frosts. Plot 2, pure Scotch pine, were doing well; but in plot 3, Oregon and Colorado varieties of the Douglas fir, both varieties have been a failure. Plots 4 and 5 were Sitka and Norway spruce unmixed, the inten-

tion being to grow pitwood on a 30 to 40 years' rotation, and not to thin hurriedly, both plots are doing well, especially the Sitka. Plot 6 consists of (*a*) beech, German larch and Scotch pine, and (*b*) beech and oak, and the latter was especially commended by Mr. Forbes, who expressed the opinion that the oaks at Bothal might have done even better if mixed with beech. Plot 7 attracted much attention. The trees are European larch from Scotch and German seed, and Japanese larch, in alternate rows, representing a wood of light-demanding trees. In this plot the Japanese larch were found to be growing exceedingly well considering the soil and situation, the former being poor and the latter not very good. The Japanese has outstripped the European variety considerably, and has suffered less from the attacks of the larch aphis. Of the European trees the plants raised from Scotch seed are larger and more vigorous than those raised in Germany, but both suffer greatly from larch aphis. Plot 8, Norway spruce and German raised larch, planted for comparison with plot 7, were not favoured by the comparison. Indeed, many of the experts present were much impressed by what they have so far seen of the possibilities of Japanese larch as a timber tree in this country. Plots 9a and 10a, a mixture of Japanese and German raised larch, with Silver fir, are doing well; but plot 9b, which was originally planted with Black Italian poplar, had been replanted this spring with Japanese larch and beech, owing to the original trees dying out. Plot 10b, which was originally planted with Black Italian poplar with Silver fir, has also shown the unsuitability of the former for the soil, and it has been replaced with oak and *Pinus monticola*. A small arboretum has been formed on the south-east corner of Broomy Hill, consisting of conifers and a few deciduous trees. As yet the results are not definite enough to tabulate.

The party then visited the trial beds of the various grass seeds, which were explained by Professor Gilchrist, who carefully detailed the advantages that had so far accrued from carefully tabulating the various results. As the grasses and clovers had only been sown the previous spring, these were not yet definite enough for publication.

Next a visit was paid to the meterological station, and the various instruments examined. This is a very useful department of the work.

Next, Cockle Park Tower claimed the attention of the party. It is an interesting old stronghold, and the late Mr. Cadwallader J. Bates, of Langley Castle, probably the most competent authority we could have, in his book "The Border Holds of Northumberland," thus writes with reference to it:—

"The tower of Cockle Park stands on high ground in the Chapelry of Hebburn, about three miles to the north of Morpeth. The length of the entire building on the west side is about 54 feet, and its width 30 feet at the north end, which projects some six feet to the east in a small wing that contains the original newel stair. On the east face of this wing is a large armorial panel much weather-worn. The whole of the southern portion of the building, now occupied as a farm house, which is three stories high, has been so much altered, first in the Jacobean style, when a stair-turret was added on the west side, and afterwards in the pseudo-Gothic, that the only original part left is the so-called North Tower, which has fine moulded corner bartizans and machico lations. . . . According to Grose, the armorial panel on the east side of the tower, now much weather-worn, contained a shield supported by two antelopes collared and chained, and surmounted by the Ogle crest of an antelope's head. It seems, therefore, improbable that the tower was built before Robert, first Lord Ogle, came into definite possession of Bothal Barony in about 1465, especially as its name does not occur in the list of Northumberland fortalices in 1415. It is first actually mentioned as having been the dower house of Anne, widow of Robert, fourth Lord Ogle, who died in 1539. In like manner, when the fifth lord, being 'commanded to invade the realm of Scotland in the King's Majesty's wars,' made his last will in 1543, 'in case of being slain by the chance of war,' as actually did befall him on Ancrum Moor, he bequeathed to his wife Jane 'Cockell Parke and Towie.' 'A projection on the west side of the tower which had small windows in it, fell,' Hodgson informs us, 'in 1828, when the opening occasioned by the fall was filled up in a line with the rest of the wall; and the mantle-piece of one of the two curious old chimneys, formerly in the tower, and cleverly decorated with dentils and mouldings, was inserted high up in the gap on the outside, by way of curiosity and ornament.' Cockle Park has descended to its present owner, the Duke of Portland, in the same manner as Bothal Castle."

Many of the visitors ascended the well-worn newel stair-case for the sake of the magnificent view to be obtained from the tower; a view that stretched far on all hands over a fine pastoral country, a particularly fine view of the Cheviots being obtained in the clear air.

Tea was provided under the shadow of the old stronghold, and was much enjoyed. After tea,

Principal J. Smith Hill said that on behalf of the Royal English Arboricultural Society he wished to thank the gentlemen who had taken the trouble to help them during the enjoyable visit they had had that afternoon. They had gone through forestry to some extent, and they had learnt something of agriculture and also something of horticulture. Their thanks were due in the first place to Alderman Carrick, who had carried through the work so well, and also to the Farm Management Sub-Committee of the County Council. That Committee might feel under a cloud just now, but it was a cloud that had a silver lining to it. What they had seen there that day was a credit to the Committee. They had seen how they were trying experiments with different seeds and manures to see what effect they would have. He believed that they were quite right in their methods of experimenting. He was of opinion that money spent on technical education by the County Council, both there and in Newcastle, would be illspent if they had not the means to enforce theoretical teaching by practical demonstration. That came, of course, from one engaged to a great extent on the theoretical side. Mr. Carrick was a busy man of business, but he was devoting himself, and all the time that he could spare from his many business engagements to supporting technical instruction of that kind. Mr. Carrick was Chairman of the Farm Management Sub-Committee, and was in touch with the business community, and when such a man said that such an institution was wanted as a coping stone to the whole of their educational work they might be sure that Northumberland would not go back but would keep up that institution for the use of future generations. (Applause.) He had also to thank Professor Gilchrist, who had been so very kind, and who had so helped them by his lucid explanations of all that they had been able to see there. Then in Mr. Forbes, they were coming to one of their own men, a member of the Council of the Royal English

Arboricultural Society, and they were greatly gratified at the position he now held. (Applause.) He would also like to include in the vote of thanks those who had attended on the tea, and he was sure that the members of the Society present were very grateful for all the kindness that had been extended to them there to-day. (Applause.)

Ald. CARRICK said he thanked them very much for the vote of thanks that they had given to the County Council and that Committee. He was sure they were heartily welcome. They were delighted to see so many ladies and gentlemen, for they were wishful that everyone who possibly could should visit Cockle Park and see what was being done, so that they could form their own opinions of its uselessness or otherwise. Professor Hill had referred to the crisis through which they were passing at this time. Certainly they had a great many critics, but then they expected to have critics. But they wanted critics who would come and see what was being done and then form their opinions. Many of them might not be interested in agriculture, but still they would have seen what steps they were taking to combine practice with theory. In regard to arboriculture, they had in Mr. Forbes a very able gentleman, whom he was sure would do a great deal for that science throughout the county. He had just recently come among them, but he was sure that he would do a great work. (Applause.) Then Professor Gilchrist was a host in himself, and night and day was working in the interests of agricultural education. He did not spare himself in the least, and if those present could only induce their friends to visit that place, every opportunity would be given them to see the work that was being done. They were not spending the ratepayers' money, as some people thought. The £600 per annum they got was part of the "whisky money," and if taken from the farm would be devoted to teaching cookery, laundry work, and such like. As agriculturists, arboriculturists, and horticulturists, they felt that they were entitled to a share of the money. (Applause.) The experiments they were carrying on would be valuable, not only to that county, but to the whole of England. (Applause.)

Professor GILCHRIST said he could only re-echo what Alderman Carrick had so ably said. They were very welcome to that

experimental station, and they were welcome to criticise and suggest at any time, and in the future those suggestions would be fully considered and carried out if likely to bring good results. (Applause.) At Armstrong College they were determined to make the forestry department, of which Mr. Forbes was the head, as thorough as possible. (Applause.)

Mr. Forbes said he also thanked them for the vote of thanks, and referring to the lectures on forestry in Hexham the previous winter, said they were most successful, thanks to the help of Mr. Edward Davidson in getting them up and getting so many members to attend. (Applause.)

A pleasant drive back to Morpeth station concluded a most enjoyable day. A word of praise is due to Mr. Edward Davidson, the Assistant Secretary, who, by his wise forethought and excellent arrangements, enabled the party to get through a quite formidable programme with the minimum of labour; but at the same time the programme was a shade too heavy for one day, and consequently, some parts had to be unduly hurried over.

NEW GEOGRAPHICAL ARBORETUM AT TUBNEY, NEAR OXFORD.

The one hundred and fifty species of conifers, comprising about two thousand plants, that were presented to our Society, in 1904, by the Hon. Mark Rolle, were planted out in the autumn of 1904 on a temporary site at Englefield Green, on the Bagshot sand, where they have since been thriving. Owing to the transfer of the Forest School from Cooper's Hill to Oxford, it has been necessary to find a permanent site for these plants, and this has been done at Tubney, about six miles from Oxford, on the Faringdon Road, in an open oak wood belonging to Magdalen College, Oxford. The site in question is on a plateau, about 250 feet above sea-level, on a deep sand covering the Coral rag.

At a Council Meeting of the Society held in London, in October, the offer of M agdalen College to find a site for the plants and to establish a Geographical Arboretum after the model of that at Tervueren, near Brussels, was accepted. A Committee, consisting of the President, Mr. Elwes, F.R.S., and Mr. G. Marshall, past President of the Society, was then appointed to arrange matters with Magdalen College, which has also appointed Mr. G. S. Baker, the Bursar of the College, Professor S. H. Vines, F.R.S., and Mr. A. D. Godley, to join the above as a Joint Committee to manage the Arboretum. Mr. Elwes has kindly offered to present two hundred species of exotic trees, and Sir Hugh Beevor has sent some American Elms. It is hoped, that other members of our Society may be able to send plants.

Meanwhile, a small nursery has been trenched and fenced, and the plants from Englefield Green have been transferred to Tubney, as well as some of Mr. Elwes' and Sir Hugh Beevor's

plants. The Committee visited Tubney on the 17th November, with Mr. G. S. Baker, and selected the site for the Arboretum, which is being strongly fenced in by the College. The expenses, after receipt of the plants, will be borne by the College; the management of the Arboretum resting with the Joint Committee. Mr. Baker has also joined our Society, which will, therefore, be strongly represented in the Committee of Management. The soil on the site is practically free from lime, and the site itself slopes northwards towards the river Thames, and is not subject to spring frosts. There is an open growth of oak trees, that are scattered over the area, which will shelter the plants at first, the undergrowth consisting almost entirely of bracken.

COMMITTEE FOR RAILWAY RATES ON BRITISH TIMBER.

INTERIM REPORT.

Your Committee has held several Meetings, and views this question as one of the greatest possible importance to members of the Royal English Arboricultural Society, to Land Owners, and Agricultural Working Men of this country. There is no doubt that these last have suffered more particularly on account of the differential rates given by the Railway Companies for Foreign, as compared with English timber, and owing to the fact that any bar to economic forestry withdraws from the labourer a highly valued opportunity of earning good wages in winter.

A study of the following ordinary comparisons will speak for itself. Any selection is merely to represent different Railway Companies :—

	January, 1905. Distance.	Foreign Wood in Plank.	English Timber in the Round.	
A	47 miles	7s.	13s. 7d.	144 divisor
B	40 ,,	7s.	11s.	(40 or 50 ft. to ton.)
C	17 ,,	4s. 8d.	7s. 6d.	
D	116 ,,	19s. 3d.	29s. 4d.	
E	133 ,,	17s. 11d.	24s. 4d.	
F	60 ,,	16s. 8d.	27s. 8d.	
G	44 ,,	8s. 7d.	13s. 1d.	
H	105 ,,	12s. 1d.	20s. 6d.	
J	48 ,,	8s. 8d.	14s. 2d.	
K	147 ,,	17s. 5d.	25s. 2d.	
L	95 ,,	11s. 8d.	19s. 2d.	

	January, 1905. Distance.	Foreign Wood in Plank.	English Timber in the Round.
M	194 ,,	15s. 9d.	26s.
N	63 ,,	8s. 9d.	13s. 2d.
O	107 ,,	12s. 3d.	20s.
P	144 ,,	16s. 11d.	26s.
Q	113 ,,	14s.	21s. 5d.
R	20 ,,	5s. 6d.	7s. 8d.
S	201 ,,		
T	195 ,,	17s 6d.	27s. 6d.
U	63 ,,		
V	66 ,,	8s. 9d.	14s. 4d.
W	64 ,,	9s. 7d.	14s. 4d.

X Hull to Birmingham, foreign Odessa round Ash 18s. 4d. per ton, including delivery in Birmingham, against Birmingham to Hull, English round Ash 23s. 6d. per ton station to station. As the cartage costs 3s. 6d. per ton, this makes an actual difference in favour of foreign timber of 8s. 8d. per ton.

In addition to the foregoing, Mr. Robt. Anderson, of Cirencester, pointed out in a letter to the *Times* in September, 1904, further cases as follows:—

Pitwood. Caerleon to Great Barr (English) in Staffordshire, 15s. per ton, a less distance than the Port of Cardiff to the same place (Foreign) which is quoted at 11s. 10d.

Cleeve to Great Barr (English) 11s. 6d., while from the Port of Gloucester, 13 miles further on and on the same line of railway (Foreign), 9s. 1d. per ton.

Telegraph Poles, etc.—Hartlepool to Cheltenham, 21s. 5d.

For round timber—Hartlepool to Cheltenham, 33s. 3d.

In addition, Mr. Anderson points out as follows:—"An acre of fir plantation cut for pitwood at 40 years growth, averaging 80 tons . . . . foreign stuff can be delivered for £47 6s. 8d., while home grown wood, grown nearer the pits, and apparently on the same route is charged £60—a difference in favour of the foreign producer of £12 13s. 4d. per acre on the rail expenses only."

Endless further cases of the same nature could be recited. Mr.

Sutton Remer, in a letter to the *Timber Trades Journal*, published May 20th, says that "the action of the Railway Companies is slowly but surely killing the English Timber Trade."

The effect of all this is to dishearten the English Timber Merchant. It causes him to despair of effecting any satisfactory business or of obtaining from the supplying landlord those extra charges which he has to pay the Railway Company; the result being that difficulties crop up between the grower and the purchaser, and supplies become more and more uncertain; an advantage in favour of foreign timber where the supplies can regularly be reckoned upon.

That trade, where English timber was recently used, in poles, pit-props, fencing timber, wheelwright's supplies, carriage building timber, wagon building timber, and railway requirements, etc., is steadily but surely developing in the direction of supplies of foreign timber, to the disadvantage of the home grown products, and this is mainly due to the prohibitive railway charges.

We believe that the Companies themselves might derive a steady and considerable income from the traffic in English timber if they used the same good judgment and energy they now display in their efforts to maintain their foreign traffic.

We have carefully considered the question of convenience of the Companies, and we have come to the conclusion that the handling of foreign timber need not be any less expensive than English timber as in the first case, in most circumstances, each piece of converted timber has to be loaded and discharged from the truck separately, whilst English timber in the round can be loaded in one or two lifts from the crane, and on this ground we do not think there is any cause for any higher rate to be demanded.

Your Committee notices with pleasure the renewed interest which has lately been taken in the question of reafforestation of the country, as shewn by the paper read by Sir Herbert Maxwell at the Society of Arts; and by other efforts recently made to bring this subject before the notice of the public. It must, however, be remembered, that no great advance can be made until the subject of Railway Rates has been considered and reformed.

In a letter published in the *Timber Trades Journal*, dated July 1st, Mr. A. L. Howard has pointed out that "foreign timber can be brought 500 miles from the interior of a Continent and 3000

odd hundred miles across the ocean at the same rate as it now costs to carry it 140 miles in this country; and whilst this condition prevails, those who produce timber at home can hardly expect much encouragement in their efforts."

In conclusion, your Committee has carefully considered the best method to be adopted by the Royal English Arboricultural Society to deal with this matter, and it has been decided that no special effort can be made in the direction of approaching the Companies themselves. Whilst your Committee will use every effort to bring about an improvement in the state of affairs, for the present it is proposed to take every opportunity publicly and privately to ventilate the subject so that general attention may be paid to it, and that all landowners and others interested will realize the true position.

(Signed) W. R. FISHER,

July, 1905. *Chairman.*

SUBJECTS OF ESSAYS FOR CURRENT YEAR, (1905-6).

1.—"The conversion of underwood into high forest." The subject to be treated from the practical knowledge of the writer.

2.—"The proportion of death rate in plantings in different soils and seasons."

3.—"The best means of propagating the different varieties of Elms in England."

4.—"Trees and Shrubs suitable for the sea side and where alkali and other fumes are prevalent." Each competitor to write of his own district."

5.—"An account of personal observations upon the internal decay of young trees."

(Professor POTTER offers to give assistance with regard to microscopical investigations.)

6.—"Life history of Beech."

7.—"To give the measured crop of timber in the case of three woods: one acre each of pure oak, larch or beech. The age to be stated, and within four years of 60. The soil and conditions to be described and the essay based upon actual instances."

8.—"Any other subject connected with Forestry."

Essays to be written on Foolscap Paper, under a *nom de plume;* to bear Essayist's Name and Address in a separately sealed Envelope; and to be in the hands of the Secretary not later than the last day of May, 1906. The Judges will have discretionary power in deciding whether or not the Essays are deserving of an award, and where a Medal is awarded, whether Gold, Silver, or Bronze.

THE SOCIETY'S LIBRARY.

List of additional books, etc., received since publication of previous list.

The Secretary will be pleased to forward to members, on loan, any of the books contained in the Library, on payment of postage; to be returned in good condition within a reasonable period.

Forestry and Irrigation *(published by American Forestry Association)*
Vol. IX., parts 3 to 12.
Do. Vol. X., ,, 1 to 10.
Do. Vol. XI. ,, 1 to 12.

Transactions of the Royal Scottish Arboricultural Society,
Vol. XVII., parts 1 and 2.
Do. Vol. XVIII.

The Scientific Proceedings of the Royal Dublin Society,
Vol. X., parts 2 and 3.
Do. Vol. XI. ,, 1 to 5.

The Scientific Transactions of the Royal Dublin Society,
Vol. VII., parts 14 to 16.
Do. Vol. VIII. ,, 1 to 16.
Do. Vol. IX. ,, 1 and 5.
Do. Vol. X. ,, 1

The Economic Proceedings of the Royal Dublin Society,
Vol. I., parts 3 to 6.

Forestry Quarterly, Vol. II., parts 1 to 3.
Do. Vol. III. ,, 1 to 4.

Arboriculture (A Magazine of the International Society of Arboriculture). Vol. I. Parts 1 to 4.
Do. Vol. II. Parts 1 to 10.
Do. Vol. III. Parts 1 to 11.
Do. Vol. IV. Parts 1 to 11.
Do. Vol. V. Part 1.

U.S. Dept. of Agriculture. Report of the Forester. By Gifford Pinchot. 1902.

Do. Dept. of Agriculture.—Report of the Forester. By Gifford Pinchot. 1903.

Do. Dept. of Agriculture.—Year Book. 1900.

Do. Bulletin No. 40.—A New Method of Turpentine Orcharding. By Dr. C. H. Herty.

Do. Bulletin No. 41.—Seasoning of Timber. By H. von Schrenk

Do. Bulletin No. 42.—The Woodlot. A handbook for owners of Woodlands in Southern New England. By H. S. Graves and R. T. Fisher.

Do. Bulletin No. 43.—A Working-Plan for Forest Lands in Hampton and Beaufort Counties, South Carolina. By T. H. Sherrard.

Do. Bulletin No. 44.—The Diminished Flow of the Rock River in Wisconsin and Illinois, and its relation to the surrounding forests. By G. F. Schwarz.

Do. Bulletin No. 46.—The Basket Willow. By W. F. Hubbard.

Do. Bulletin No. 47.—Forest Resources of Texas. By W. L. Bray

Do. Bulletin No. 48.—The Forests of the Hawaiian Islands. By W. L. Hall.

Do. Bulletin No. 49.—The Timber of the Edwards Plateau of Texas. By W. L. Bray.

Do. Bulletin No. 50.—Cross-Tie Forms and Rail Fastenings with special reference to Treated Timbers. By H. von Schrenk.

Do. Bulletin No. 51.—Report on the Condition of Treated Timbers laid in Texas, February 1902. By Hermann von Schrenk.

Do. Bulletin No. 52.—Forest Planting in Western Kansas. By Royal S. Kellogg.

Do. Bulletin No. 53.—Chestnut in Southern Maryland. By Raphael Zon.

Do. Bulletin No. 54.—The Luquillo Forest Reserve, Porto Rico. By John C. Gifford.

U.S. Dept. of Agriculture—Bulletin No. 55.—Forest Conditions of Northern New Hampshire. By Alfred K. Chittenden.

Do. Bulletin No. 58.—The Red Gum. By Alfred K. Chittenden

Do. Bulletin No. 59.—The Maple Sugar Industry. By Wm. F. Fox and Wm. F. Hubbard.

Do. Bulletin No. 60.—Report on an examination of a Forest Tract in Western North Carolina. By Franklin W. Reed.

Do. Bulletin No. 61.—Terms used in Forestry and Logging.

Do. Bulletin No. 24.—A Primer of Forestry, part 2. By Gifford Pinchot.

Do. Circular No. 21.—Practical Assistance to Farmers, Lumbermen and others, in Handling Forest Lands.

Do. Circular No. 22.—Practical Assistance to Tree Planters.

Do. Circular No. 26.—Forest Fires in the Adirondacks in 1903. By H. M. Suter.

Do. Circular No. 29.—Exhibit of Tree Planting on a Model Prairie Farm at the Louisiana Purchase Exposition.

Do. Circular No. 30.—Exhibit of Forest Planting in Woodlots at the Louisiana Purchase Exposition.

Do. Circular No. 31.—Exhibit of a Forest Nursery at the Louisiana Exposition.

Do. Circular No. 32.—Progress Report on the Strength of Structural Timber. By W. Hendrick Hatt.

Do. Circular No. 33.—What Forestry means to Representative Men.

Do. Circular No. 35.—Forest Preservation and National Prosperity.

Do. Progress of Forestry in 1904. By Quincy R. Craft.

Do. The Attitude of Lumbermen toward Forest Fires. By E. A. Sterling.

Do. The Determination of Timber Values. By Ed. A. Braniff.

Do. Recent Progress in Timber Preservation. By H. von Schrenk.

Forestry. By Dr. Adam Schwappach.

Journal of the Royal Horticultural Society. Vol. XXIX., part 4.

Recently Recognised Species of Cratægus in Eastern Canada and New England. By C. S. Sargent.

Cratægus in Eastern Pennsylvania. By C. S. Sargent.

Bulletin of the New York Botanical Garden. Vol. II., No. 6.

Cape of Good Hope Dept. of Agriculture.—Reports of the Conservators of Forests for the year 1904.

A Handbook of the Trees of California. By Alice Eastwood.

Cratægus in Rochester, New York. By C. S. Sargent.

Cratægus in North Eastern Illinois. By C. S. Sargent.

Genus Cratægus in Newcastle County, Delaware. By C. S. Sargent

Manual of the Trees of North America. By C. S. Sargent.

Schlich's Manual of Forestry, Vol. III. (3rd edition), Forest Management. By W. Schlich.

The Forestry Problem in the United Kingdom. By W. Schlich.

Elementary Forestry. By Charles E. Curtis.

Diary and Directory for Land Agents, Auctioneers, etc., 1906 Published by Estates Gazette Limited.

Horticulture and Forestry, International Exhibition, St. Louis, 1905. Report by British Juror.

Working-Plan of Castle Hill Woodlands. By W. R. Fisher.

FORESTRY AT ARMSTRONG COLLEGE.

An arrangement has just been made between the Officer of Woods (represented by Mr. F. F. Horner) and the authorities of Armstrong College, by means of which the Crown woods at Chopmill, extending to 800 acres, will in the future be placed under the charge of the Lecturer on Forestry at the College, for the purpose of being used as a demonstration area for the use of the forestry students. It is hoped that the woods will shortly be available for giving employment to young working foresters who may desire to take a course of lectures on forestry and the allied sciences at the College, which is only eight miles distant, and can be reached in half-an-hour.

OBITUARY.—Mr. COTTIGNIES.

Mr. Cottignies, *Inspecteur des Eaux et Forêts*, and honorary member of our Society, died of consumption at Villers Cotterêts, at the age of 48, on the 14th of last November. Members of our Society, who visited the Forêt de Retz in August, 1902, will remember the kindness and intelligence with which Mr. Cottignies showed us the beautiful forest then under his charge. He was subsequently transferred to Versailles, but still kept up his house at Villers Cotterêts. His name was also entered on the list for promotion, as Conservator of Forests, and in him the French Forest Department mourns one of its best foresters, who is thus prematurely cut off.

Abstract of Accounts

OF THE

Royal English Arboricultural Society,

FOR THE

Year ended August, 1905.

Statement of Accounts for

REVENUE

RECEIPTS.

By Balance brought forward—			
In Bank	£124 8 0		
Cash in hand	12 13 7		
		£137 1 7	
,, Subscriptions—Life Members ...	55 13 0		
Ordinary Members	193 14 6		
		249 7 6	
,, Advertisements	... ...	13 5 0	
,, Bank Interest on Deposit ...	... ...	1 17 2	
		£401 11 3	

CAPITAL

*Gross liability to Life Members brought down ...	£233 0 0	
Subscriptions from Life Members during current year	55 13 0	
	288 13 0	
Amount payable to Revenue Account—		
64 Life Members at 7/- ...	£22 8 0	
3 do. at 4/- ...	0 12 0	
	23 0 0	
	£265 13 0	

***Extract from Sub-Committee's Finance Report.**

That in defining the liability of the Society to its Life Members, this shall be taken at the sum of £233 in August, 1904. This amount has been fixed by assuming the average age on admittance to be 45, with an expectation of life of 24 years, working on the 4 per cent. table. The Life Membership in August, 1904, was: 64 Five Guinea Members and 3 Three Guinea Members, with an average term of membership of 8 years.

To find the liability in succeeding years, the sums received for Life Subscriptions shall be added to the Capital Sum of the previous year, and the following deductions shall be made:—For each £5 5s. member, 7s. per annum; for each £3 3s. member, 4s. per annum; and for each £2 2s. member, 3s. per annum.

the year ended August, 1905.

ACCOUNT.

PAYMENTS.

Use of Rooms for Council Meetings and Councillors' Railway Fares—Sept., 1904 ...	£15 12 9		
March, 1905	12 19 9		
		£28	12 6
Medals		2	3 6
Printing *Transactions*, including Blocks, Copyright of Photos, and Postage		69	2 0
Stationery and Sundry Printing		16	9 6
Postages, Telegrams, Railway Carriages, &c. ...		23	18 0
Reporter's Fees and Expenses		8	8 0
Expenses in connection with the Plants presented by the Hon. Mark Rolle		5	19 0
Secretary and Treasurer's Salary		25	0 0
Assistant Secretary's Salary		15	10 0
		195	2 6
By Deposit in Bank	124 8 0		
„ Cash in hand	82 0 9		
		206	8 9
		£401	11 3

ACCOUNT.

By Deposit at Bank	£124	8 0
„ Cash in hand	82	0 9
	206	8 9
„ Net liability to Life Members	59	4 3
	£265	13 0

Examined and found correct,

BERNARD COWAN, } *Auditors.*
WILLIAM CLOUGH, }

APPENDIX.

THE

Royal English Arboricultural Society

LIST OF OFFICE-BEARERS AND MEMBERS

CORRECTED TO AUGUST,

1905.

Patrons.

His Most Gracious Majesty the King.

The Right Hon. the Earl of Durham, Lambton Castle, Durham
The Right Hon. the Earl of Carlisle, Naworth Castle, Brampton
The Right Hon. Lord Avebury, High Elms, Hayes, Kent
Thomas Taylor, Esq., Chipchase Castle, North Tyne
The Right Hon. the Earl of Crewe, Crewe Hall, Crewe, Cheshire
The Right Hon. Lord Masham, Swinton, Masham
John Maughan, Esq., P.A.S.I., Jervaulx, Middleham
F. W. Beadon, Esq., Longley Hall, Huddersfield
Mr. Coroner Graham, Findon Cottage, Sacriston, Durham
Dr. Somerville, The Board of Agriculture, Whitehall, S.W.
George Marshall, Esq., Godalming, Surrey

President

Professor W. R. Fisher, 6 Linton Road, Oxford

Vice-Presidents.

C. G. Grey, Dublin
A. T. Gillanders, Alnwick Castle, Alnwick
John Scott, Newton, Stocksfield
William Milne, Hexham
J. W. Robson, Hexham
William Forbes, 11 Dale Street, Liverpool
W. D. Cruddas, Haughton Castle, Northumberland
Bernard Cowan, F.R.H.S., South Shields
Joseph S. Gray, Richhill, Co. Armagh
George Gallie, Sledmere, York
W. B. Havelock, The Nurseries, Brocklesby
Principal J. Smith Hill, The Agricultural College, Aspatria

Honorary Vice-President.

M. Daubré, Directeur des Eaux et Forêts, Paris

Members of Council.

George Cooper, Gateshead
A. C. Forbes, Armstrong College, Newcastle
J. P. Robertson, Chatsworth, Derbys.
H. J. Elwes, Colesborne, Cheltenham
Sir Hugh Beevor, Bart., Croxley Green
A. J. Forrest, Thorney, Peterborough
Edward Shipley, 20 North Road, Darlington
W. A. Herd, Nurseryman, Penrith
Wm. Elder, Cholmondeley, near Malpas
Chas. Hankins, Wordwell, Culford, Bury St. Edmunds
George Ross, The Nurseries, Hexham
T. Bewick, Raby Castle, Staindrop, Darlington
Leslie S. Wood, High Street, East Grinstead
Professor Potter, Armstrong College, Newcastle
D. Hamilton, Knowsley, Prescot
T. W. Luke, Greenshaw Plain, Hexham
W. A. Forster, Belgrave Lodge, Pulford, Wrexham
Thomas Roberts, Easebourne, Midhurst
Professor Fraser Storey, Bangor, North Wales
Robert Anderson, Cirencester
James Barrie, Stevenstone, Torrington

Secretary and Treasurer.

John Davidson, Estate Office, Haydon Bridge, Northumberland

Assistant Secretary.

Edward Davidson, Estate Office, Haydon Bridge, Northumberland

Auditors.

Bernard Cowan, Westoe, South Shields
Alderman Clough, Gateshead

Local Secretaries.

W. B. Havelock, Brocklesby, Lincolnshire
William Forbes, 11 Dale Street, Liverpool
Bernard Cowan, Westoe, South Shields
William Fleming, Tudhoe, Durham
James Barrie, Torrington, North Devon
Francis Mitchell, Woburn, Bedford
Edward Shipley, 20 North Road, Darlington
Frank Hull, Lillieshall, Newport
W. A. Forster, Belgrave Lodge, Pulford
W. Tomlinson, Clumber, Worksop
A. J. Forrest, Thorney
William Elder, Cholmondeley, near Malpas
Thomas Roberts, Midhurst, Surrey
Edward Davidson, Estate Office, Haydon Bridge
Robert Coupar, Ashford, Co. Galway
W. Storie, Highclere, Newbury
John Mitchell, Strid Cottage, Bolton Abbey
Charles Hankins, Bury St. Edmunds
D. A. Glen
A. T. Gillanders, Alnwick Castle, Alnwick
George Clark, Haltwhistle
Thomas Lewis, Fair Oak House, Roath Park, Cardiff
Capt. Davidson, Harrogate
D. C. Legard, Lincoln

Judges.

John Maughan, P.A.S.I., Jervaulx
Joseph S. Gray, Richhill, Co. Armagh
A. C. Forbes, Armstrong College, Newcastle

Forestry Examiners.

William Forbes, 11 Dale Street, Liverpool
W. B. Havelock, Brocklesby
Principal J. Smith Hill, B.A., Aspatria

Honorary Members.

Date of Election	
1883	Avebury, The Right Hon. Lord, High Elms, Hayes, Kent
1882	Balden, John, Bywell, Stocksfield
1893	Bougler, Professor, F.L.S., F.G.S., 11 Onslow Road, Richmond, S.W.
1887	Carlisle, The Right Hon. the Earl of, Naworth Castle, Brampton, Cumberland
1883	Clark, Henry, H. Clark & Sons, The Saw Mills, Haltwhistle
1900	Clibran, A., Hale Farm Nurseries, Altrincham
1900	Clibran, L., Hale Farm Nurseries, Altrincham
1902	Cottignies, Monsieur, Inspecteur des Eaux et Forêts, Villers Cotterêts, France
1902	Daubré, Monsieur, Conseiller d'Etat et Directeur des Eaux et Forêts, 78 Rue de Varenne, Paris
1885	Durham, The Right Hon. the Earl of, Lambton Castle, Durham
1883	Fernow, B. E., New York State College of Forestry, Cornell University, Ithaca, N.Y.
1900	Fletcher, Dr., Entomologist and Botanist, Central Experimental Farm, Ottawa, Canada
1901	Herd, S., 24 Wordsworth Street, Penrith
1902	Lafosse, Monsieur, Conservateur des Eaux et Forêts, Dep. de l'Agriculture, 78 Rue de Varenne, Paris
1890	Mitchell (Mrs.), Strid Cottage, Bolton Abbey, Skipton
1894	Nicholson, George
1902	Peiffer, Monsieur, Inspecteur des Eaux et Forêts, Compiegne, France
1902	Récopé, Monsieur, Administrateur des Eaux et Forêts, 78 Rue de Varenne, Paris
1892	Somerville, Dr., Board of Agriculture, Whitehall, London, S.W.

Date of Election

Life Members.

1905 Adkin, B. W., Land Agent and Surveyor, 14 Queen Street, Cheapside, E.C.

1882 Admiralty, Lords Commissioners of, Greenwich Hospital Branch, Whitehall, S.W.

1900 Aris, J. Whitton, M.A., F.S.I., Lois Weedon House, Towcester, Northamptonshire

1895 Armstrong, Lord, Cragside, Rothbury

1895 Balfour, Professor Isaac Bayley, The University, Edinburgh

1895 Barron, John, Elvaston Nurseries, Derby

1896 Beaumont, W. C. B., M.P., Bywell Hall, Stocksfield

1902 Bedford, His Grace the Duke of, K.G., Woburn Abbey, Bedfordshire

1895 Bolam, George, Land Agent, Berwick-upon-Tweed

1895 Boord, W. B., Beverley, Pateley Bridge, Yorks.

1890 Bouverie, Henry H. P., 1 Pall Mall East, London, S.W.

1890 Burrill, T. O., Masham, Bedale, Yorkshire

1901 Carr, Cuthbert E., Land Agent, 1 Collingwood Street, Newcastle

1904 Champion, G. E., Estate Office, Linton Park, Maidstone

1901 Clibran, Wm. R., Nurseryman, Oldfield Nursery, Altrincham, Cheshire

1905 Crisp, Fred A., " Broadhurst," Godalming, Surrey

1896 Dalgleish, J. Edward, The Nurseries, Market Weighton

1905 Dimsdale, Robt., Ravenshill, Lechlade, Glos.

1897 Dorman, A. J., Grey Towers, Nanthorpe, R.S.O., Yorks.

1900 Elliott, B. G., Timber Merchant, 124a Kentish Town Road, London, N. W.

1902 Eve, Harry T., K.C., Pullabrook, Bovey Tracey, South Devon

1900 Fairfax-Cholmeley, Hugh C., Brandsby, Easingwold

1902 Foster, John, jun., Horton-in-Ribblesdale, Settle, Yorks.

1902 Fox, Wm. F., Adbury, Newbury

1902 Gilchrist, Professor, Armstrong College, Newcastle-on-Tyne

1893 Gough, W., Wykeham, York

1888 Graham, John, Findon Cottage, Sacriston, Durham

1895 Headlam, Capt. R. A., Gilmonby Hall, Bowes, Darlington

1902 Hinckes, Ralph T., Foxley, Hereford

1902 Hooker, Reginald H., Royal Gardens, Kew

Date of Election

1895 Huggon, Thos., Estate Bailiff, Callally, Whittingham, R.S.O.
1887 Joicey, Edward, Blenkinsopp Hall, Haltwhistle
1887 Jonas, Henry, Surveyor, 23 Pall Mall, London, S.W.
1904 Jonas, H. Driver, 23 Pall Mall, London
1899 Laird, D. P., Pinkhill, Murrayfield, Edinburgh
1897 Lamb, Major S. E.
1897 Lamb, R. O., Hayton Hall, How Mill, near Carlisle
1900 Leeds, His Grace the Duke of, Hornby Castle, Bedale
1890 Leyland, C. J., Haggerston Castle, Beal, Northumberland
1897 Lockey, W., Tragan Avenue, South Shields
1896 Marchant, R. C., M.R.A.C., F.C.S., P.A.S.I., 18 Elliston Road, Redland, Bristol
1895 Margerison, Samuel, Calverley, Leeds
1889 Marshall, S. A., Skelwith Fold, Ambleside
1883 Marshall, R. D., Castle Rigg Manor, Keswick.
1901 Martin, James, Wood Manager, Knipton, Grantham
1895 Masham, The Right Hon. Lord, Swinton, Masham
1891 Maughan, John, P.A.S.I., Land Agent, Jervaulx, Middleham
1899 Middleton, Sir Arthur E., Bart., Belsay Castle, Newcastle-on-Tyne
1902 Middleton, Professor, Agricultural Department, Cambridge University
1886 Newbiggen, John T., Kennedy & Co., Nurserymen, Dumfries
1902 Northumberland, His Grace the Duke of, K.G., Alnwick Castle, Alnwick
1903 Parker, Thomas, Estate Office, Highclere, Newbury, Berks.
1893 Peel, Edward L., 9 Whitehall Place, London, S.W.
1883 Plummer, Arthur B., Architect, Prior's Terrace, Tynemouth
1895 Portland, His Grace the Duke of, Welbeck, Worksop
1900 Robertson, Watson Askew, J.P., Ladykirk, Norham
1905 Rogers, Chas. Gilbert, Imperial Forest Service of India, c/o Messrs. Grindlay & Co., 54 Parliament Street, S.W.
1892 Rolle, The Hon. Mark, Stevenstone, Torrington
1883 Sample, C. H., Land Agent, Matfen, Corbridge
1905 Skelley, Sir John C. E., Bart., Avington, Alresford, Hants.
1901 Smyth, Hugh Lyle, J.P, D.L., Barrowmore, Chester
1901 Stirling, C., Gargunnock, Stirlingshire

Date of Election

1904 Story, Professor Fraser, Lecturer on Forestry, University College of North Wales, Bangor, Wales

1895 Straker, J. H., Howden Dene, Corbridge

1890 Straker, J. C., The Leazes, Hexham

1904 Sutherland, His Grace the Duke of, K.G., Lillieshall House, Newport, Shropshire

1903 Taylor, W. F., Nurseryman and Seed Merchant, Lytton Nurseries, Stevenage, Herts.

1893 Veitch, Harry James, 34 Redcliffe Gardens, South Kensington, London, S.W.

1901 Waring, William A., Woodlands, Chelsfield, Kent

1896 Watney, Daniel, 33 Poultry, London

1883 Watt, James, Little & Ballantyne, Carlisle

1905 Wellington, His Grace the Duke of, Ewhurst Park, Basingstoke

1894 Wood, A. F. N., Belswardyne Hall, Shrewsbury

1903 Woodruffe-Peacock, Rev. E. Adrian, Cadney Vicarage, Brigg

Ordinary Members.

1905 Ackers, B. St. John, Huntley Manor, Gloucester

1905 Ackers, C. P., Huntley Manor, Gloucester

1902 Ackroyd, George H., Head Gardener, Howick, Lesbury

1904 Adams, S. J., Forester and Clerk of Works, Adscombe Cottage, Over Stowey, Bridgwater

1904 Adams, J. W. Atken, Resident Agent, Estate Office, Moat Mount, Mill Hill, Middlesex

1902 Affleck, R., J.P., Bloomfield, Durham Road, Gateshead

1904 Aitken, G. H., Land Agent, Longleat Estate Office, Warminster

1886 Alexander, William, South View, Hexham

1896 Allan, Alexander, Forester, 41 Bradford Street, Caerphilly, Cardiff

1891 Ames, Victor, Forester, Thornham Cottage, King's Lynn, Norfolk

1902 Anderson, Robert, Assistant Forester, Chatsworth, Derbyshire

1903 Anderson, Robert, Land Agent, Cirencester

1901 Andrew, Duncan, 8 Rainton Terrace, Park Road, Hale, Cheshire

Date of Election

1905 Annet, Thos., Assistant Forester, c/o Mr. A. Payne, Bower Ashton, near Bristol

1905 Argent, Thos., Forester, Buscot Park, Faringdon, Berks.

1892 Armitage, Fred, 3 Burston Road, Putney, London, S.W.

1882 Armstrong, T. J., Land Agent, 14 Hawthorn Terrace, Newcastle

1898 Armstrong, W., Land Agent, Sunderlandwick, Driffield, Yorks.

1893 Armstrong, Addison & Co., Timber Merchants, Sunderland

1898 Armstrong, Thomas, Timber Merchant, Cockermouth

1904 Arnott, James, 9 Eslington Terrace, Newcastle-on-Tyne

1905 Ashdown, A. H., Land Agent, Uppington, Wellington, Salop

1900 Ashworth, G. W., Timber Merchant, Waterfoot

1902 Atkin, James T., Salisbury House, South Shields

1894 Atkinson, William, Royal Nurseries, Handsworth, Sheffield

1900 Atkinson, W. Penrose, Nurseryman, Handsworth, Sheffield

1902 Atkinson, Geo. Blaxland, Timber Merchant, Newcastle-on-Tyne

1902 Atkinson, Thomas H., St. Eilans, Hexham

1903 Bagshaw, C., c/o H. S. King & Co., 9 Pall Mall, London

1900 Bailiffe, John, Forester, Poole, South Milford, Yorks.

1900 Bainbridge, T. R., Grove House, How Mill, near Carlisle

1882 Balden, Robert S., Bywell, Leeds Road, Dewsbury

1902 Ballantyne, John, Foreman Forester, Chatsworth, Beeley, Rowsley, Derbyshire

1898 Balme, Frank M. P. Jones, J.P., High Close, Ambleside

1893 Barclay, David, Sherbourne, North Leach, Gloucestershire

1899 Barclay, Robert Leatham, 54 Lombard Street, London, E.C.

1901 Barfoot, William S., Assistant Forester, Flimwell, near Hawkhurst, Kent

1905 Barker, A., Forester, Shanbally, Clogheen, Cahir, Co. Tipperary, Ireland

1895 Barnard, The Right Hon. Lord, Raby Castle, Staindrop, Darlington

1882 Barrett, R. B., Skipton Castle, Skipton

1882 Barrie, James, Forester, Stevenstone, Torrington, N. Devon

1890 Barrie, William, Ellerton, York

1902 Barrie, James Alexander, Forester, Harlestone, Northampton

Date of Election

1902 Barrie, David H., Forester, Llangedrwyn Hall, Llangedrwyn, near Oswestry, N. Wales

1904 Barton, H. S., Land Agent, Hewshott House, Liphook, Hants

1899 Batchelor, E. J., Nurseryman, Harlow Heath Nurseries, Harrogate

1892 Bayliss, Jones & Bayliss, Victoria Works, Wolverhampton

1882 Beadon, F. W., Land Agent, Estate Office, Huddersfield

1882 Beattie, Thomas, Assistant Forester, Langley Old Hall, Huddersfield

1905 Beaver, Robt., Assistant Forester, Crookise, via Skipton

1901 Beeson, Walter, Estate Agent, St. John's College, Oxford

1903 Beeton, H. R., 9 Maresfield Gardens, Hampstead, London

1900 Beevor, Sir Hugh, Bart., 17 Wimpole Street, Cavendish Square, London, W.

1895 Bell, J. R., Thorpe Perrow, Bedale

1895 Bell, Thomas, Forester, Widdrington Cottage, Acklington

1900 Bell, Charles L., Wolsington Hall, Newcastle-on-Tyne

1905 Bennet, John, Forester, Towns End, Wolverton, Basingstoke, Hants

1904 Benson, R. T., Auctioneer, Parkside House, Darlington

1904 Bentley, Joseph, Chemical Manufacturer, Barrow-on-Humber, Hull

1905 Berney, A. H., Land Agent, Estate Office, Damerham, Salisbury

1900 Berry, George, Cockle Park, Morpeth

1892 Bewick, Thomas, Head Forester, Raby Castle, Staindrop, Darlington

1897 Bewick, John William, Forester, Streatlam Castle, Darlington

1898 Bewlay, William H., Nurseryman, Hall Santon, Holmrook, Carnforth

1899 Blair, Percy A. F., Lindon Grove, Nutton Rudly, Cleveland

1902 Blues, Thomas S., Dean Street, South Shields

1893 Boa, Andrew, Land Agent, Great Thurlow, Haverhill

1905 Bodger, W. Thos, 10 Urfa Terrace, South Shields

1899 Bolam, T. W., F.R.H.S., General Cemeteries Superintendent, Sunderland

1901 Bolitho, T. R., Trengwainton, Hea Moor, R.S.O., Cornwall

1900 Bond, Thomas, Head Forester, Lambton Castle, Durham

Date of Election

1902 Boorman, Alfred S., Assistant Forester, Bedgebury Park, Goudhurst, Kent

1904 Borthwick, Dr. A. W., D.Sc., Royal Botanic Gardens, Edinburgh

1904 Boston, Richard, Hallgarth House, Carthorpe, Bedale

1903 Bourne & Sons, Messrs., Nurserymen, Royal Nurseries, Beckington, near Bath

1904 Bovill, Geo. B., Land Agent, Rhydycreua, Bettws-y-Coed, North Wales

1900 Bowker, Joseph, Superintendent of Cemeteries, Darlington

1901 Bowles, William A., Head Gardener, Adare Manor, Adare, Co. Limerick, Ireland

1905 Bowman, John, Timber Merchant, Newcastle-on-Tyne

1901 Bown, Arthur, Architect, James Street, Harrogate

1902 Boyd, John, Forester, Wood Cottage, Kennishead, Thornliebank

1904 Bradford, Dr. John Rose, F.R.S., 8 Manchester Square, London, W.

1903 Braid, J. B., Forester, The Park, Great Whitley, Stourport, Worcestershire

1905 Briggs, Arthur C., Gledhow Grange, Leeds

1897 Bright, Tom, Estate Agent and Valuer, 10 Mount Street, Grosvenor Square, London, W.

1891 Broadbent, George Alexander, Moor Lane, Netherton, near Huddersfield

1903 Brocklehurst, H. D., Sudeley Castle, Winchcombe

1901 Brodie, Hugh R., Bedford Office, Thorney, near Peterborough

1898 Brown, William, Saw Mills, Brandon, Suffolk

1903 Brown, W. R., Head Forester, Park Cottage, Heckfield, Winchfield, Hants

1905 Brown, Edw. J., 16 Bigby Street, Brigg, Lincs.

1896 Brownlow, J. T., Seedsman, The Crescent, Gateshead

1898 Bruce, Nathan M., Forester, Old Hall, Snettisham, Norfolk

1905 Brunton, James, Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.

1894 Brydon, John, Messrs. Kent & Brydon, Nurserymen, Darlington

1903 Buchanan, Henry, Land Agent, Ashford, near Bakewell

Date of Election.

1895 Burnett, G. J. M., Land Agent, Elstree Cottage, Elstree
1900 Cadell, George, National Club, 1 Whitehall Gardens London, S.W.
1899 Caldecott, John A., Long Lawford, Rugby
1902 Caldwell & Sons, Nurserymen, Knutsford, Cheshire
1894 Cameron, Alexander, Forester, Longleat, Warminster, Wilts
1900 Cameron, J. J., A. & J. Main & Co., Limited, Clydesdale Iron Works, Possil Park, Glasgow
1903 Capper, H. F., Estate Agent, The Northgate, Ross, Herefordshire
1903 Capper, Captain R. H. Ord, The Northgate, Ross, Hereford
1901 Carradus, W., Assistant Forester, Wray, Hornby, Lancaster
1895 Carrick, Thomas, The Park, Haydon Bridge-on-Tyne
1894 Cartlidge, J. C., Rufford Mill, Ollerton, Newark
1902 Castle, R. Lewis, F.R.H.S., Manager Woburn Fruit Farm, Bedfordshire
1902 Caswell & Bowden, Ltd., Timber Merchants, Newton Chambers, Cannon Street, Birmingham
1901 Chapman, F., Forester, Wansford, Northants
1905 Chapman, H., Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbyshire
1902 Cheeseman, Robert E., Cashier, Chatsworth, Chesterfield
1882 Clark, J. M., Land Agent, Haltwhistle
1891 Clark, Thomas, Wentworth Nurseries, Hexham
1891 Clark, George, Land Agent, Haltwhistle
1902 Clark, E. T., The Goddards, Snaith, R.S.O., Yorkshire
1902 Clark, John, Head Forester, Swinton, Masham, Yorkshire
1905 Clark, J. S., Estate Agent, Bothal, Morpeth
1891 Clarke, Christopher, Land Agent, Charlcot, Bedale
1892 Clarke, J. W., Land Agent, Guisborough, Yorks.
1902 Clarke, Thomas, Eskmeals, Bootle, S.O., Cumberland
1902 Clarke, Joseph, Forester, Rose Cottage, Shipbourne, Tonbridge, Kent
1901 Clayton, John W., Forester, Slacksliad Manor, Romsey, Hants
1901 Clayton, [Thomas L., Assistant Forester, Manby Lodge, Broughton, Brigg, Lincs.
1904 Cleeves, Charles M. R., Land Agent, Highfields, Frant, Sussex

Date of Election	
1894	Clough, W., Ravenhurst, Low Fell, Gateshead
1902	Clough, A. H., Castletop, Burley, Ringwood, Hants.
1904	Cobb, Herbert, Land Agent, Higham, Kent
1903	Cocker, James, The Gardens, The Chesters, Humshaugh
1900	Coles, S. H. Cowper, Land Agent, Penmyarth, Crickhowell
1890	Collins, F., Forester
1900	Colton, John H. C., c/o G. & T. Coward, Carlisle
1899	Conway, Thomas, Forester, High Legh, Knutsford, Cheshire
1888	Cooper, George, Superintendent of Cemetery, Gateshead
1899	Corking, Joseph T., 42 Jackson Street, Gateshead
1895	Cosans, John, Abbey View, 56 Tragan Avenue, South Shields
1886	Coupar, Robert, Forester, Ashford, Co. Galway
1904	Coventry, B. O., Indian Forest Service, Murrice, Punjab, India
1882	Cowan, Bernard, F.R.H.S., The Lodge, Harton Cemetery, South Shields
1902	Cox, W. W., Forester, Newby Lodge, Ripon
1899	Cranston, Geo. Dryderdale, Hamsterley, via Witton-le-Wear, Darlington
1896	Crewe, The Right Hon. the Earl of, Crewe Hall, Crewe, Cheshire
1901	Crombie, T. Alex., Head Forester, Estate Office, Longhurst, Morpeth
1904	Crooks, James, Eccleston Park, Prescot
1905	Crooks, F., "Woodlands," Eccleston Park, Prescot
1903	Crosland, W., J.P., Estate Office, Buscot Park, Faringdon, Berks
1903	Crosby-Salt, H., Land Agent, Barrington Park Estate Office, Burford, Oxon.
1894	Crowell-Pollard, J., 53 Rutland Gardens, Hove, Brighton
1902	Crozier, John, Head Forester, Durris Estate, Aberdeen
1884	Cruddas, W. D., Haughton Castle, Humshaugh, R.S.O.
1897	Cumming, W., Forester
1904	Cundy, Joseph W., Land Agent, Linby, Notts.
1904	Currie, Archibald, 48 Jesmond Road, Newcastle-on-Tyne
1902	Dalton, Col. H. Wade, Hauxwell Hall, Finghall, R.S.O., Yorks.
1905	Dashwood, A. H., Stibbington House, Wansford

Date of Election

1883 Davidson, William, Presville, Kent Road, Harrogate
1882 Davidson, John, Land Agent, Haydon Bridge-on-Tyne
1893 Davidson, Edward, Estate Office, Haydon Bridge-on-Tyne
1894 Davidson, John, jun., Chesterwood, Haydon Bridge
1901 Davidson, W., Head Forester, Manor Yard, Margam, Port Talbot
1901 Davidson, Thomas E., Architect
1903 Davison, Richard, Schoolmaster, National School, Belford
1899 Deane, Arthur, Forester, 92 Hood Lane, Sankey Bridges, Warrington
1895 Dent, John W., Wm. Wear & Co., Timber Merchants, Hexham
1898 Dickinson, William, Forester, Park House, Arundel, Sussex
1905 Dingwall, Robt., 6 Neville Street, Newcastle
1893 Dixon, W., Falkenberg, Harrogate
1891 Dodds, F. W., The Limes, Cressage, Shrewsbury
1885 Dodsworth, F. & W., Collingwood Street, Newcastle-on-Tyne
1894 Doig, C., Forester, Thoresby, Worksop
1905 Donne, C. H., Land Agent, The Abbey Ruins, Bury St. Edmunds
1900 Drane, Donald, Land Agent, Raughton, Norwich
1902 Drummie, Alex. C., Assistant Forester c/o Mr. J. Embleton, Linnolds Wood Cottage, Hexham
1905 Duff, Thos., Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.
1903 Duthie, J. Allardyce, Manager, Ben Reid & Co., Ltd., Nurserymen and Seedsmen, Aberdeen
1905 Duthie, John, Assistant Forester, Brook Cottage, Ramsdell, Basingstoke, Hants.
1898 East, William, Florist, Fowler Street, South Shields
1905 Edmondson, F., Florist, Green Market, Newcastle
1902 Eggar, J. Alfred, Land Agent, Farnham, Surrey
1892 Elder, William, Forester, Cholmondeley Park, near Malpas, Cheshire
1891 Ellis, Thomas, The Larches, Hexham
1902 Ellison, R. H., Head Forester, Bleach Green, Witton Gilbert, Durham
1905 Ellison, Ed., Forester, Corballis House, Rathdrum, Co. Wicklow

Date of Election

1904 Eltringham, Alfred, Accountant, 3 Marine Approach, South Shields

1900 Elwes, H. J., F.R.S., Colesborne, Cheltenham

1905 Evans, H., 55 Markham Avenue, Harebills, Leeds

1904 Ewing, Guy, F.S.I., Land Agent, Edenbridge, Kent

1905 Faragó, Adalbert, Forest Nurseries and Seed Establishment to His Majesty the Emperor of Austria and King of Hungary, Waldsamen Klenganstalt mit Dampfbetriet, Baumschule, Samen-Handlung, in Zalaegerszeg (Ungarn), Hungary

1891 Fawcett, James W., The Grange, Satley, Darlington

1898 Ferguson, John, Dene Croft, Jesmond Park East, Newcastle

1902 Ferguson, R. C. Munro, M.P., Raith, Kirkcaldy

1902 Fife, H. L., Land Agent, Staindrop House, Darlington

1905 Finn, M. Randolph, Property Manager, Argyle Street, Hebburn-on-Tyne

1895 Fisher, Professor, 6 Linton Road, Oxford

1903 Fisher, C. B., Land Agent, Market Harborough

1883 Fleming, William, Tudhoe, Co. Durham

1899 Fogg, J. J., Ingleside, Heron Road, Meols, Cheshire

1883 Forbes, William, 11 Dale Street, Liverpool

1898 Forbes, A. C., Armstrong College, Newcastle

1902 Forbes, Robert G., jun., Forester, Gulworthy, Tavistock

1903 Forbes, R. G., sen., Land Agent, Hursley Park, Winchester, Hants. (since resigned)

1903 Forbes, A., Foreman Forester

1890 Ford, John Walker, Enfield Old Park, Winchmore Hill

1898 Forgan, William, Forester, Bowood, Calne, Wilts.

1890 Forrest, A. J., Bedford Office, Thorney, Peterborough

1888 Forster, W. A., Forester, Belgrave Lodge, Pulford, Wrexham

1902 Fortune, Charles, Isalee, Coppice Drive, Harrogate

1899 Foster, Christopher, 212 Pownall Green, Bramhall, Stockport

1904 Fotheringham, W. Steuart, Murthly, Perthshire, N.B.

1894 Fox, Arthur, Assistant Forester, High Street, Sedgefield, Ferryhill

1903 Foxton, J. T., Head Forester, Riversvale, Burbage, Buxton, Derbys.

1898 Fraser, John, Forester, 121 Latimer Road, Eastbourne, Sussex

Date of Election

1904 Fraser, Wm., Assistant Forester, Lillieshall, Newport, Salop
1886 Gallie, George, Sledmere, York
1899 Gallie, Alex., Head Forester, Estate Office, Somerley, Ringwood
1899 Gamble, J. S., F.R.S., Highfield, E. Liss, Hampshire
1903 Garnett, Thos., Sub-Agent, Ford Cottage, Lumley Castle, Chester-le-Street
1899 Garratt, William, Land Agent, Melbourne, near Derby
1902 Gibson, George R., Tyne Saw Mills, Hexham
1903 Gibson, W. M., Privy Purse Office, Buckingham Palace, S.W.
1902 Gilbert, John, Antony Estate Office, Treval, near Torpoint, R.S.O., Cornwall
1905 Gilbert, Arthur Chas., Assistant Land Agent, Antony Estate Office, Treval, near Torpoint, R.S.O., Cornwall
1895 Gilchrist, John Mc.Bride, Forester, Kinnel Park, Abergele, N. Wales
1897 Giles, C. P., M.P., Copse Hill House, Wimbledon, Surrey
1886 Gillanders, A. T., Forester, Park Cottage, Alnwick
1901 Gilles, Alexander, J.P., Gateshead
1892 Glen, D. A., Forester
1902 Glover, F. R., Timber Merchant, Three Oaks, Lathom, near Ormskirk
1902 Glover, Thomas, Timber Merchant, Delamere Villa, Lathom, near Ormskirk
1904 Gordon, Peter, Assistant Forester, Battersby, Ingleby, Greenhow, York
1901 Gott, Frank, F.S.I., Land Agent, 3 East Parade, Leeds
1897 Gough, Reginald, Forester, Wykeham, York
1904 Grace, H. W., J.P., Hallgarth Hall, Winlaton, Co. Durham
1890 Graham, Joseph, Approach House, 105 South Woodbine Square, South Shields
1894 Graham, David, Forester, The Green, Newbridge-on-Wye Radnorshire
1900 Graham, W., 40 Crown Street, Newcastle-on-Tyne
1901 Graham, W., Timber Merchant, Alnwick
1896 Grant, William, Wood Bailiff, Aspinall's Farm, Almond Brook, Wigan

Date of Election

1893 Gray, Joseph S., Fruitfield, Richhill, Co. Armagh, Ireland
1901 Gray, Robert, Land Agent, Sherborne Park, North Leach, Gloucestershire
1902 Gray, Chas. A., Assistant Forester
1894 Greene, T., 21 Belgrave Terrace, Newcastle-on-Tyne
1899 Greenwell, His Honour Judge Francis John, Greenwell Ford, Lanchester
1894 Greenwood, Charles H., Petworth Park, Sussex
1903 Grenfell, Arthur P., Cossington, Bridgwater
1882 Grey, C. G., 8 Landsdowne Terrace, Ballsbridge, Dublin
1898 Groves, John, Gardener
1902 Griesdale, R. D., C.E., Deputy Waterworks Engineer for the Halifax Corporation, Halifax
1901 Gull, Sir Cameron, Bart., Frilsham House, Yattendon, Berks
1896 Gullachsen, L. H., 10 Pilgrim Street, Newcastle
1902 Gullachsen, L. W., 10 Pilgrim Street, Newcastle
1897 Guthrie, Captain, Linden Gardens, Harton, South Shields
1900 Hadfield, T. W., Estate Office, Mere, Knutsford, Cheshire
1904 Haggart, Wm., 4 Myrtle Crescent, South Shields (Since resigned)
1895 Hall, W. T., Highclere, Newbury
1896 Hamilton, D., Knowsley, Prescot
1903 Hamilton, G. J., Balgowrie, Harrogate
1893 Hankins, Charles, Forester, Wordwell, Culford, Bury St. Edmunds
1903 Hannah, George, Head Forester, Ampton, Bury St. Edmunds
1888 Hanson, A., Bailiff, South Elmsall, Doncaster
1905 Hanson, Clarence O., Staunton, Coleford, Glos.
1905 Harland, George, Commercial Buildings, 97 Hudson Street, Tyne Dock
1902 Harris, H. E., New Lodge, Plaitford, Romsey, Hants.
1904 Harris, G. M., c/o Wm. Fell & Co., Ltd., Royal Nurseries, Hexham
1904 Harvey, John, Forester, Trentham Estate, Stoke-upon-Trent, Staffordshire
1900 Haswell, B., Eslington Villas, Low Fell, Gateshead
1901 Hatcher, Bertram H., Forester, Poplars Green Lodge, Panshanger, Hertford
1893 Havelock, Henry, Forester, Raby Castle, Darlington

Date of Election

1883 Havelock, W. B., The Nurseries, Brocklesby, Lincolnshire
1902 Hawkshaw, J. C., Hollycombe, Liphook, Hants.
1903 Heaton. K., Land Agent, Alton, Hants.
1905 Hedefine, Ed., Castletown House, St. Aidan's Road, South Shields
1896 Hedley, T. A., Steward, The Hermitage, Barrasford
1893 Henderson, David, Forester, Bath House, High Melton, Doncaster
1894 Henderson, James, 13 Oxford Street, Whitley Bay
1903 Henry, Dr. A., Kew, London
1893 Herd, W. A., Nurseryman, Penrith
1894 Herd, Isaac, Nurseryman, Penrith
1885 Heskett, W. J., Land Agent, Penrith
1904 Hibberd, Thos., junr., Assistant Forester, Bolton Abbey, Skipton
1896 Hill, Claud, Nurseryman, Stone
1899 Hill, Principal J. Smith, B.A., Agricultural College, Aspatria
1895 Hilson, John, Forester. Pusey, Farringdon, Berks.
1900 Hilson, M., Canford Magna, Wimborne, Dorset (since left)
1904 Hobbs, Francis, Land Agent, Crown Office, Monmouth
1904 Hollis, John, Forester, Godmersham Estate, Canterbury, East Kent
1904 Hornby, James J., Knowsley, Prescot
1899 Houblon, Colonel Archer, Hallingbury Place, Bishops Hatford, Essex
1901 Howard, E. Stafford, C.B., Thornbury Castle, Thornbury, R.S.O., Gloucestershire
1904 Howard, A., Sutherland House, 3 Lloyds Avenue, Fenchurch Street, London, E.C.
1904 Huggins, David, Walshford, Wetherley, Yorks.
1889 Hull, Frank, Forester, Lillieshall, Newport, Salop
1904 Hull, George, Assistant Forester, Lilleshall, Newport, Salop
1903 Hutchinson, Wm., Assistant Forester, Knipton, Grantham, Lincolnshire
1901 Hyslop, James S., Land Agent, Middleton-in-Teesdale, Co. Durham
1902 Imeson, John, Assistant Forester, Swinton, Masham
1903 Inglis, Alex., Forester, Bridge Hill, Belper, Derbys.

Date of Election

1904 Innes, G. P. Mitchell, Land Agent, Craig-yr-Haul, Castleton, Cardiff
1905 Irish, Chas., Head Forester, Hinlow St. George, Crewkerne
1897 Irving, G., Estate Agent, West Fell, Corbridge
1900 Iveson, William, Auctioneer, Hexham
1905 Jackson, H. F., Land Agent and Accountant, Park Hill, Rockdale
1893 James, C. H., Rudchester, Wylam
1898 James, William, Naworth Estate Office, Brampton, Carlisle
1904 James, Arthur J., J.P., Edgeworth Manor, Cirencester
1894 Jamieson, D., Barroole Cottage, Foxdale, Isle of Man
1903 Jeffries, W. J., The Nurseries, Cirencester
1902 Jenkin, W. A., Land Agent, Liskeard, Cornwall
1899 Johnson, George, Assistant Forester
1902 Johnson, Wm., Land Agent, Trench Hall, Gateshead
1905 Johnson, George, Forester, Biningborough Estate, Shipton, Yorks
1898 Johnston, Robert, Forester, Angus Cottage, Preston, Duns, N.B.
1898 Johnston, Andrew, Assistant Forester, Old Road, Studley, Calne, Wilts.
1903 Johnstone, Robert, Assistant Forester, Chatsworth Estate, Beeley, Rowsley, Derbys.
1903 Jones, Richard, Head Forester, West Dean Park, Chichester
1905 Jones, Walter, Land Agent, Lechlade Manor, Glos.
1893 Kelly, J. G., West View, Pontefract
1904 Kendle, Geo. Robert, Land Agent, Wilton, Salisbury
1896 Kennedy, John, Millgreen Cottage, Ingatestone, Essex
1903 Ker, A. P., Land Agent, Cattle Market, Hexham
1895 Kidd, William, Forester, Harewood, Leeds
1904 Kimm, John J., Head Forester, Chesters, Humshaugh-on-Tyne
1904 Kininmouth, Wm., Assistant Forester, Wynyard Park, Wolviston, Durham
1904 Knollys, Cyprian R., Land Agent, Grange Estate Office, Alresford, Hants.
1897 Laidlaw, P. O., Stone Croft, Fourstones
1902 Laidlaw, John, Foreman Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.

Date of Election

1902 Laidler, G. G., 40 Northumberland Street, Newcastle-on-Tyne
1897 Laine, James, Estate Steward, Shorewell, via Newport, Isle of Wight
1897 Laine, F. J., Head Forester, Ladylands, Shorwell, Isle of Wight
1902 Laird, John, Forester, Buckland, Bwlch, R.S.O., Breconshire, Wales,
1905 Langdale, Arthur O., B.Sc., 7 Framlington Place, Newcastle-on-Tyne
1901 Lascelles, Hon. Gerald, The King's House, Lyndhurst
1899 Laws, J. M., Washington Village, R.S.O., Co. Durham
1904 Learmont, John, c/o. Wm. Learmont & Son, Larchfield Nurseries, Dumfries
1901 Lee, Henry, Malpas, Cheshire
1901 Lee, Edward S., Woodlands, Hexham
1902 Lees, Wm., Foreman Forester
1896 Legard, D. C., Heighington, Lincoln
1900 Lewis, Thomas, Fair Oak House, Roath Park, Cardiff
1902 Lewis, J. H., M.P., N. Side, Clapham Common, S.W.
1903 Lewis, H. C., Land Agent, Whittlebury, Towcester
1904 Liddell, George, The Grange, Kimblesworth, via Chester-le-street
1890 Lincoln, Edward H., Cleadon, via Sunderland
1902 Linskill, Thomas, Mowbray House, 113 East Parade, Harrogate
1900 Little, Adam, Mousen Hall, Belford
1903 Lloyd, Cyril, Assistant Forester, Chatsworth Estate, Edensor, Bakewell, Derbys.
1899 Lock, Hampton C., Head Forester, Middleton, Tamworth
1883 Lockhart, L. C., Solicitor, Hexham
1883 Lockhart, H. F., Hexham
1899 Lockhart, Peter, Land Agent, Estate Office, Corby Castle, Carlisle
1894 Luke, Thomas W., Forester, Greenshaw Plain, Hexham
1904 Luttrell, J. F., Dunster Castle, Dunster, Somerset
1896 Mabane, J. R., Balfe House, Park Terrace, South Shields
1902 Macdonald, George N., Forester, Raith, Kirkaldy
1902 Macdonald, John, Assistant Forester

Date of Election

1905 Macdonald, H. M., c/o Mr. A. T. Gillanders, Park Cottage, Alnwick.
1898 Mack, Robert, Nurseryman, Catterick, Richmond, Yorks.
1904 Macky, M., Leather Merchant, 36 Highbury, West Jesmond, Newcastle-on-Tyne
1891 Maister, C. L. N., Swinton Estate Office, Masham
1902 Mansfield, John Henry, Assistant Estate Agent, Howick, Lesbury, Northumberland
1892 Marsden, James, Assistant Forester, Clifton Castle, Bedale
1890 Marsh, W. D., Land Agent, Broughton, Skipton-in-Craven
1895 Marshall, George, Land Agent, Frimstone, Liphook, Hants.
1892 Marshall, T. D., Solicitor, King Street, South Shields
1898 Marshall, W. H., Place Fell House, Patterdale, Penrith
1899 Marshall, Peter, Forester, Euston, Thetford, Suffolk
1903 Marshall, F. C., Riseholm Grange, Lincoln
1903 Marshall, M. W., Timber Merchant, Godalming, Surrey
1899 Martin, Thomas, F.S.I., Hampden House Club, London, N.W.
1891 Mason, John, Estate Office, Grantley, Ripon
1904 Mason, J. E., Horticultural Chemical Merchant, Barrow on-Humber, Hull
1883 Matheson, Thomas, Nurseryman, Morpeth
1903 Matthews, Councillor J. L. Hampton, Scalby House, Kent Road, Harrogate
1902 Maude, A., Ivy Mount, Eastbourne, East Sussex
1899 Maudlen, J. C., 43 Osborne Road, Newcastle-on-Tyne
1904 Maw, Percival T., Land Agent, Holmesdale, Nutfield, Surrey
1902 May, George, Simonside Hall, South Shields
1891 Mc.Andrew, P., Forester, Prudhoe Hall, Prudhoe
1904 Mc.Beath, David, Forester to Liverpool Corporation, Quarry Road, Brinscall, Chorley, Lancs.
1900 Mc.Bride, D., Gardener, High Legh, Knutsford, Cheshire
1895 Mc.Cracken, William, Land Agent, Englesea House, Crewe
1899 Mc.Dougall, Alexander, Forester, Duncombe Park, Hemsley, R.S.O., Yorks.
1905 Mc.Dowell, John, 58 Julian Avenue, South Shields
1903 Mc.Gibbon, R., Forester, Wentworth, near Rotherham

Date of Election

1905 Mc.Glashan, John, Assistant Forester, Chatsworth Estate, Pilsley, Bakewell, Derbys.

1902 Mc Kechnie, Angus, Assistant Forester, c/o Mr. A. T. Gillanders, Alnwick Castle, Alnwick

1900 Mc.Lean, Duncan, Forester, Brandon, Coventry

1902 Menzies, James, Forester, Pitney, Langport, Somersetshire

1902 Methven, John, Thomas Methven & Sons, Nurserymen, Edinburgh

1899 Michie, James, Forester, The Nurseries, Orwell Park, near Ipswich

1900 Middleton, S., 173 Portland Street, Newcastle-on-Tyne

1904 Mildred, Geo. B., Land Agent, Preston House, Cirencester

1899 Miles, Charles, Timber Merchant, Stamford, Lincolnshire

1902 Miller, J. W., F.S.S, Union Club, Trafalgar Square, London, S.W.

1901 Miln, T. E., Nurseryman, Darlington

1894 Milne, William, W. Fell & Co., The Royal Nurseries, Hexham

1902 Milne, A., Nurseryman, 32 Hanover Street, Edinburgh

1896 Milnthorpe, John, Nurseryman, Gowlands, Westgate Road, Newcastle-on-Tyne

1884 Mitchell, John, Forester, Strid Cottage, Bolton Abbey, Skipton

1884 Mitchell, Francis, Park Farm Office, Woburn, Bedfordshire

1902 Mitchell, F. W., Welbeck, Worksop

1904 Mitchell, John, junr., Assistant Forester, Bolton Abbey, Skipton

1905 Mitford, Alfred, 5 Ocean Road, South Shields

1899 Moffat, R., Head Gardener, Leazes Park, Newcastle-on-Tyne

1899 Moir, E. Mc.Arthur, 46 Melville Street, Edinburgh

1894 Molyneux, Job, Curraghmore, Portlaw, Ireland

1902 Moore, Charles, Assistant Forester, Bedgebury Park, Goudhurst, Kent

1896 Moran, J. A., Editor *Land Agents' Record*, 149 Strand, W.C.

1900 More, W. H., Crown Receiver for Wales and County Monmouth, Noddfa, Harlech

1904 Moreton, Lord, Sarsden House, Chipping Norton

1903 Morgan, H., Forester, Pontygwaith Farm, near Treharris, R.S.O., S. Wales

Date of Election

1903 Morrison, W. J., Head Master, Haydon Bridge Shaftoe Trust School, Haydon Bridge

1901 Mortimer, M. W., Land Agent, Culford, Bury St. Edmunds

1902 Moses, George H., Coniscliffe Road, Darlington

1897 Moult, John, Underhill, Low Fell, Gateshead

1905 Mounsey, Harry, Assistant Forester, c/o John Johnston, 2 Graham Street, Longtown

1902 Mowat, George, Assistant Forester, Cotgrave, Nottingham

1902 Muir, John, Assistant Forester, Culshobben, Portwilliam, Wigtownshire, N.B.

1895 Mulford, Fred, Timber Merchant, 1 Elm Grove Road, St. David's, Exeter

1901 Munford, James, 143 and 145 Queen's Road, Westbourne Grove, Bayswater, London, W.

1902 Munro, Hugh, Forester, etc., Garden Cottage, Holkham, Norfolk

1905 Napier, H. W., Land Agent, Ashton Court Estate Office, Bristol

1899 Naylor, R. A., Cuerden Hall, Thelwell, Cheshire

1905 Naylor, Henry, Timber Merchant, Driffield, Yorks.

1904 Neate, A. W., junr., Land Agent's Pupil, Newbury, Berks.

1901 Nelthorpe, R. N. S., Scawby Hall, Lincolnshire

1904 Newnham, J. H., Home Timber Editor, *Timber Trades' Journal*, 11 Leighton Road, West Ealing, W.

1902 Nichol, James, Forester, Croxteth, Liverpool

1899 Nixon, J. J., Cambo, R.S.O., Northumberland

1903 Nixon, George, Estate Office, Shawdon, Glanton, R.S.O., Northumberland

1905 Norman, Robert, Assistant Forester, Ardgowan, Inverkip, Greenock, N.B.

1899 Oakley, John H., 10 Waterloo Place, Pall Mall, London, S.W.

1903 Ord, George, Causey Wood, Marley Hill, Newcastle-on-Tyne

1895 Orkney, W. C., Surveyor's Office, Montrose Royal Asylum

1898 Ormiston, Walter, Lee Walton & Co., Timber Merchants, Langley-on-Tyne

1904 Orwin, C. S., F.S.I., South Eastern Agricultural College, Wye, Kent

Date of Election

1904 Osmond-Smith, F. H., Land Agent, Lewes Villa, Uckfield, Sussex

1900 Pain, W. H., F.S.I., Land Agent, Carnarvon Estate Office, Bingham, Notts

1905 Palfrey, Henry, Foreman Forester, Ampton Park, Bury St. Edmunds

1895 Palliser, James, Rose Bank, Blackhill, Co. Durham

1896 Palliser, William, Blackhill, Co. Durham

1900 Palliser, R. S., Royd Mount, Grove Road, Harrogate

1905 Parker, F. W., Parks Dept., London County Council, 11 Regent Street, S.W.

1903 Parsons, R. M. P., Land Agent, Misterton, Crewkerne, Somerset

1900 Pearson, G., The Glen, Lancaster Road, Harrogate

1905 Pennick & Co., Nurserymen, Delgany Nurseries, Co. Wicklow

1902 Perkins, Henry, c/o Messrs. Wood & Ingram, The Nurseries, Huntingdon

1902 Perkins, John Edward, Nurseryman, Billing Road Nurseries, Northampton

1902 Perkins, John Edward, jun., Nurseryman, Billing Road Nurseries, Northampton

1898 Perry, James, Assistant Forester, Bury, near Dulverton, Somerset

1905 Petch, John S., P.A.S I., Estate Office, Wensley, Leyburn, Yorks.

1896 Petrie, David, Westoe Hotel, South Shields

1900 Pewson, Leonard, 80 Cheapside, London, E.C.

1899 Philip, William W., Factor, Gigha, Argyleshire, N.B.

1904 Piek, S., Nurseryman, 5 Leazes Terrace, Hexham

1902 Pike, Thomas, Saltwell Hall, Saltwell Lane, Gateshead-on-Tyne

1899 Pitcaithley, Alex., Forester, Jeannie Bank, Old Scone, Perth

1904 Pitt, Dr. J. Newton, 18 Portland Place, W.

1894 Pollard, Henry, 72 and 74 Fowler Street, South Shields

1895 Pope, William, Gardener, Highclere, Newbury

1896 Pope, Alfred, Assistant Forester, White Crag, Timble, Otley, Yorks.

1902 Popert, E. P., Superintendent Forester, Braceland, Collford, Glous.

Date of Election

1902 Portal, Maurice, Land Agent, Estate Office, Beaufront Castle, Hexham
1895 Potter, Professor, Armstrong College, Newcastle-on-Tyne
1904 Powell, James, Caerphilly, Wales
1900 Price, Jos., Estate Office, High Legh, Knutsford, Cheshire
1899 Pride, Lieut.-Col. W. H., 5 Lancaster Avenue, Sefton Park, Liverpool
1904 Pritchard, H., St. Fagans, Cardiff
1905 Puttock, W. H., Billinghurst, Sussex
1900 Rafn, Johannes, Tree Seed Merchant, Skovfrökontoret, Copenhagen—F.
1895 Ralston, W. H., Land Agent, Streatlam Castle, Darlington
1904 Readhead, John, Shipbuilder, Rockcliffe, Westoe, South Shields
1893 Reed, J. T., Caldwele Villa, South Shields
1902 Reid, Hugh, Forester, Ashton Court, Long Ashton, near Bristol
1905 Remer, J. S., Derby Road, Canada Dock, Liverpool
1902 Renton, George, Estate Agent, Grove Villas, Queen Parade, Harrogate
1904 Renton, T. R. V., Surveyor and Auctioneer, Albert Street, Harrogate
1905 Richards, G. C. Smyth, Land Agent, Castle Hill, nr. South Molton
1901 Richardson, C., Land Agent, 15 Barn Hill, Stamford
1901 Richardson, E. C., Land Agent, 15 Barn Hill, Stamford
1901 Richardson, C. E., Forester, Easton Hall, Grantham
1904 Riley, L. J. C., Agent, Putley Court, Ledbury, Herefordshire
1892 Ritson, Morley, Timber Merchant, Hexham
1890 Roberts, Thomas, Forester, Park Gate, Easeborne, Midhurst, Surrey
1898 Roberts, John, Forester, The Livox, St. Arvans, Chepstow
1895 Robertson, Thomas, Woodlawn, Co. Galway, Ireland
1901 Robertson, J. P., Forester, Chatsworth Estate, Edensor, Bakewell, Derbys.
1888 Robinson, J. F., Timber Merchant
1900 Robinson, Robert, Head Forester, Angerton, Morpeth
1900 Robinson, Robert, Forester, 10 Summer Hill, Shotley Bridge

Date of Election

1882 Robson, J. W., Joseph Robson & Son, The Nurseries, Hexham

1902 Robson, Robert, 42 Northumberland Street, Newcastle-on Tyne

1905 Robson, Joseph, Timber Merchant, Prudhoe-on-Tyne

1904 Rogers, John P., Penrose, Helston, Cornwall

1902 Rolleston, Sir John F. L., M.P., Glen Parva Grange, Leicester

1891 Ross, George, Joseph Robson & Son, The Nurseries, Hexham

1901 Royce, D. N., Auctioneer, etc., Oakham

1901 Rundle, Edward C., Bedford Office, Tavistock

1895 Rutherford, J. A., Land Agent, Highclere, Newbury

1883 Sample, Thomas, Land Agent, Bothal Castle, Morpeth

1902 Santer, William, Timber Merchant, Hawkhurst, Kent

1904 Saunders, A., Forester, Delamere Forest, Kingswood Cottage, Kingswood, Frodsham

1904 Sawyer, J. A., Land Agent, Winchester, Hants.

1901 Schlich, Dr., Royal Engineering College, Coopers Hill, . Englefield Green

1904 Scholfield, E. P., Estate Office, Somerley, Ringwood, Hants.

1903 Schott, Dr. Peter Carl, Knittelsheim, Palatinate, Germany

1904 Score, H. B., Lathom Park Schools, Ormskirk, Lancashire (since resigned)

1883 Scott, John, Land Agent, Newton, Stocksfield

1895 Scott, John D., Estate Office, Brushford, Dulverton

1893 Scott, James, Timber Merchant, Hill Crest, Ryton

1898 Scott, A., Forester, Southwick, Fareham, Hants.

1902 Scott, John S., Wythenshawe Estate Office, Northenden, Cheshire

1896 Seaton, A., Forester, Hawarden, Chester

1904 Sewell, Wm. W. R., Brandlingill, Cockermouth

1904 Shaw, Wm. Thos., Horris Bank, Newtown, Newbury

1897 Shearburn, H., Munstead, Godalming, Surrey

1901 Shearburn, R. B., The Hall, Snaith, R.S.O., Yorkshire

1899 Sheriff, Stephen, The Bungalow, Westoe, South Shields

1883 Shipley, Edward, 20 North Road, Darlington

1898 Shortt, John, Forester, Blagdon, Cramlington, Northumberland

Date of Election

1901 Short, George, Forester, Ravensworth, Gateshead
1898 Simpson, W. A., Skipton Castle, Skipton, Yorks.
1903 Simpson, Alderman David, C.C., Four Ash, Harrogate
1904 Skewis, Edwin, Brendon, The Drive, Tonbridge
1885 Slater, Herbert, Forester, Greenlands, Henley-on-Thames
1901 Slater, Ed., Supt. Elswick Cemetery, Newcastle-on-Tyne
1905 Slater, Andrew, junr., Estate Clerk, The Red House, Durrington, Salisbury
1884 Smith, David, Woodman, Scremerston, Berwick-upon-Tweed
1887 Smith, Stephen, Bailiff, Blenkinsop, Haltwhistle
1888 Smith, William, Timber Merchant, Gunnerton, Barrasford
1892 Smith, J. M., Kensington Terrace, South Shields
1896 Smith, J. O., Derwentside Terrace, South Shields
1901 Smith, James, Estate Bailiff, Matfen, Corbridge-on-Tyne
1903 Smith, Harry, Woodside Cottage, Scremerston, Berwick
1904 Smith, Cuthbert, Land Agent's pupil, Thorney, Peterborough
1904 Smith, Chas., jun., Nurseryman, Grindleford Bridge, Sheffield
1905 Smithson, John, Timber Merchant, Prudhoe-on-Tyne
1891 Spence, John, Timber Merchant, Ripon
1900 Spencer, Thomas, Head Gardener, Goodrich Court, Ross, Herefordshire
1904 Stamer, W. E., Land Agent, Lilleshall Lodge, Newport, Shropshire
1904 Stanworth, D., Assistant Forester, Newport, Salop
1903 Staton, John E., Schoolmaster, 64 Stalker Lees Road, Sheffield
1904 Stenning, W. V. K., Halsford, East Grinstead
1891 Stewart, Dr., Hexham
1900 Stewart, Alexander, Forester, Shadwell Court, Thetford
1902 Stock, W. F. K., County Analyst, Darlington
1901 Stocks, Ben, Architect, St. Peter's Street, Huddersfield
1903 Stook, J. E. H., P.A.S.I., M.R.A.C., Land Agent and Surveyor, 2 Palace Yard, Hereford
1893 Storie, W., Forester, Whitway House, Newbury, Berks
1898 Storie, Wm., Head Forester, Gulworthy, Tavistock, Devon
1902 Storie, A. B., Forester, "Goodwood," East Dean, Chichester, Sussex

Date of Election

1900 Straker, F., Angerton, Morpeth
1904 Studdy, T. E., Estate Office, Basing Park, Alton, Hants
1894 Surtees, R. G., Contractor, Colwell, Barrasford
1894 Swales, John, Fowler Street, South Shields
1901 Swallow, Edward, Estate Agent, Orton Estate Office, Peterborough
1900 Swinburne, Sir John, Capheaton Hall, Newcastle-on Tyne
1898 Swinney, William, 10 Wentworth Terrace, South Shields
1893 Symm, John, Engineer, Newton, Stocksfield
1902 Tate, George, Forester, Grinkle Park, Lofters, York
1887 Taylor, Thomas, Chipchase Castle, Wark-on-Tyne
1898 Taylor, John
1898 Taylor, John, Lansdowne House, South Shields
1901 Taylor, John, Supt. St. Andrew's Cemetery, Newcastle-on-Tyne
1902 Taylor, George, Assistant Forester, Foresters' Bothy, Newton Hanzard, Wolviston, Stockton-on-Tees
1903 Taylor, Charles, Assistant Forester, Highclere, Newbury, Berkshire
1903 Taylor, James, Forester, Hainton, Lincoln
1904 Taylor, Robert, Assistant Forester, Etal, Cornhill-on-Tweed
1902 Temperley, Nicholas, J.P., 4 Carlton Terrace, Low Fell, Gateshead
1905 Terry, Ernest, Estate Agent, Great Finborough, Stowmarket
1903 Thimbleby, A. C., 47 Queen's Road, Reading, Berks.
1899 Thomas & Co., Ltd., Ceres Works, Liverpool
1902 Thomas, J. H., North Lodge, Wimpole Estate, near Royston, Cambs.
1904 Thomas, E. Aubrey, 6 Brechin Place, Gloucester Road, London, S.W.
1905 Thompson, Thos. E., Estate Office, Jervaulx Abbey, Middleham, R.S.O., Yorks.
1902 Thomson, John, West End Park, South Shields
1901 Thomson, Robert, Woods Foreman, 57 Park Hill, Ampthill, Beds.
1902 Thomson, F. J., Land Agent, Baggrow Brow, Brayton, Carlisle
1902 Thomson, Walter, Castle Gardens, Alnwick
1892 Thornton, Councillor, Thorney Terrace, South Shields

Date of Election	
1900	Thornton, George, Gardener, Ingleton, Darlington
1905	Thring, Douglas T., Land Agent, Boughton House, near Kettering
1903	Thwaites, Wm., Joiner, Swinton, Masham, Yorks.
1905	Thynne, Col. A., 50 Cadogan Square, London
1903	*Timber Trades Journal,* The Editor of the, 164 Aldersgate Street, London
1902	Tindle, John, Solicitor, Westoe, South Shields
1901	Tomkinson, James, M.P., J.P., Willington Hall, Tarfully, Cheshire
1893	Thomlinson, Wilson, Forester, Clumber, Worksop, Notts.
1899	Totty, Harry, Forester
1902	Towner, John, Assistant Forester, Maypole Lane, Goudhurst, Kent
1902	Tremlett, Walter W., Land Agent, Tallington, Stamford
1893	Tristram, Rev. Canon, D.D., F.R.S., The College, Durham
1904	Trussler, H., Assistant Forester, Ardgowan, Inverkip, Greenock
1902	Tully, Jas. B., Abbotsford, Mahoon, East London, C.C., South Africa
1905	Tully, Robt., 9 The Lawe, South Shields
1901	Tuppeney, William, Assistant Forester, Seacox Heath Lodge, Hawkhurst, Kent
1900	Turnbull, Andrew, Assistant Forester, Picktree, Chester-le-Street, Co. Durham
1895	Turner, Warner, Land Agent, Welbeck
1902	Twelves, William, Foreman Forester, Chatsworth Estate, Ashford, Bakewell
1901	Vayro, John, Assistant Forester, Healey, Masham, Yorks.
1902	Wade, Alderman, North Road, Halifax
1901	Wainwright, Ormond F., Forester, Belton, Grantham
1892	Wakenshaw, J. W., Runnymede, Kenton, Newcastle-on-Tyne (since resigned)
1890	Walker, J. J., Timber Merchant, Orchard House, Hexham
1897	Walker, J. D., Solicitor, 21 Pilgrim Street, Newcastle
1905	Walker, Sir Francis E., Bart., Swansfield House, Alnwick
1891	Ward, D. M.
1901	Ward, R. R., Morewell Farm, Tavistock
1905	Ware, J. G. Wyndham, Eaton Hastings, Faringdon, Berks.

Date of Election

1903 Warnock, J., Government Timber Inspector, 173 Herbert Road, Plumstead, Kent

1903 Waterer, F. Gomer, The American Nursery, Bagshot, Surrey

1901 Watney, Herbert, M.D., Buckhold, Pangbourne, Berks.

1900 Watson, John Graves, 11 Chester Crescent, Newcastle-on-Tyne

1902 Watson, Thomas, Steward, Model Farm, Porter's Park, Shenley, Herts.

1895 Watt, J. W., Little & Ballantyne, Carlisle

1896 Watt, Alex., Land Agent, The Grove, Ravenglass, Carnforth

1899 Watt, George Frederick, Sturton House, Churchill, nr. Kidderminster

1894 Watters, John, Forester, Ridley Hall, Bardon Mill, Carlisle

1902 Weigall, A. G., Land Agent, Hardingstone, Northampton

1903 Weir, Alex., Assistant Forester, Chatsworth Estate, Beeley, Rowsley, Derbys.

1901 Wells, Ed. S., Assistant Forester, Flimwell, near Hawkhurst, Kent

1901 Wells, Hugh, Assistant Forester, Flimwell, near Hawkhurst, Kent

1902 Went, Robert T., Forester, Bute Workshops, Blackmeir, Cardiff

1903 Wheeler, H. J., Nurseryman, Warminster

1904 Wheldon, M. L., P.A.S I., Land Agent's Assistant, c/o F. Handley, Esq., 17 St. Mary's, York

1893 Whitaker, John, Forester, Abbeystead, Lancaster

1902 Whitcombe, George E., Park Farm, Woburn, Beds.

1890 White, William, Forester

1899 White, Joseph, House and Land Agent, 58 King Street, South Shields

1901 White, John, Forester and Bailiff, Appleby Hall, Doncaster

1901 White, Lieut.-Col., F. A., Land Agent, Burghley Estate Office, Stamford

1904 White, John, Assistant Forester, Wynyard Park, Wolviston, Durham

1904 Whitehead, Robert Henry, Bede College, Whitley Bay

1901 Whitmore, T. G., Timber Merchant, Bury St. Edmunds

Date of Election

1895 Whittingham, W., Estate Office, Sledmere, York
1892 Wilkinson, W., Assistant Forester
1904 Wilkinson, C. J., Sebergham Castle, Dalston, Cumberland
1901 Willians, Jas. H., Assistant Forester, Staindrop, Darlington
1886 Wilson, John, The Leazes Park, Newcastle-on-Tyne
1894 Wilson, Henry, Architect, Hexham
1901 Wilson, John, Harton, South Shields
1902 Wilson, Joseph, Timber Merchant, Pelaw Grange Saw Mills, Birtley, R.S.O., Co. Durham
1902 Wilton, J. P.
1902 Winch, W. F., Land Agent, Cranbrook, Kent
1897 Winder, James, Gardener, Howden Dene, Corbridge
1898 Wiseman, Edward, Nurseryman, Elgin
1898 Wood, George, Brandon, Suffolk
1900 Wood, John, Estate Office, Brandsby, Easingwold
1901 Wood, Leslie S., F.S.I., High Street, East Grinstead
1902 Wood, H. C., P.A.S.I., Land Agent, Chester's Estate Office, Humshaugh, R.S.O., Northumberland
1903 Wood, W. J., Cabinet Manufacturer, 66, 68 and 70 Cuthbert Street, South Shields
1904 Woodcock, R. Frank, Land Agent, Haslemere
1902 Wright, A. Ireland, Carleton House, Newcastle-on-Tyne
1904 Wright, N. J., Timber Merchant, Morpeth
1905 Wright, Alfred, The Gardens, Eshott Hall, Felton R.S.O.
1902 Wylam, Ralph J., Assistant Forester, Chester Lodge, Lambton Park, via Chester-le-Street
1904 Yorke, Maurice, 35 New Walk, Leicester
1893 Young, T. J., College of Agriculture and Horticulture, Holmes Chapel, Cheshire
1896 Young, Harry, J., 32 Esplanade, Whitley Bay
1896 Young, Dr., Whitley Bay
1902 Young, Henry B., Blanking Estate Office, Metheringham, Lincoln
1902 Young, F. E., Land Agent, Londesborough, Market Weighton, Yorks.

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